Public Review Panel on Tanker Safety and Marine Spills Response Capability

Protecting our waters

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Public Review Panel on Tanker Safety and Marine Spills Response Capability

Final report

September 1990

Protecting our waters

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Industry, Science and Technology Canada
Environment Canada

Foreword

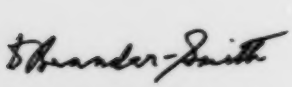
Canada's coastline is among the longest in the world and its continental shelf one of the largest. The coast is geographically diverse, with sandy beaches, rocky shores and headlands, salt marshes and estuaries, fjords, bays and coves, and ice-scoured shorelines. The adjacent territorial waters are ecologically diverse and rich in marine resources, including numerous species of fish, shellfish, seabirds and mammals. Extensive inland waters include the Great Lakes and the major river systems of the Fraser, the Mackenzie and the St. Lawrence. These waterways, the backbone of Canada's marine transportation network, link the land to the sea and provide habitat and migratory corridors for fish, waterfowl and a variety of mammals.

As we travelled throughout Canada, we were shocked by the extent to which our coastal and inland waters are polluted. It is one thing to read about isolated problems in the comfort of home, but quite something else to witness first-hand how seriously many areas are polluted. Pollution from oil and chemical tankers and barges to date has represented a relatively small part of industrial pollution, but in many environmentally sensitive areas even a little could be disastrous. In these areas, a major oil spill would be one of the greatest environmental catastrophes this country has ever seen.

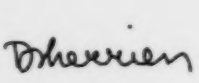
In our interim report we dealt briefly with some of the more critical problems we had noted to that date. Since then, we have returned to British Columbia and visited the Great Lakes and St. Lawrence regions, the Maritimes, the Yukon, the Northwest Territories and Alberta. We are grateful to all those who submitted briefs to us, participated in the public hearings and consulted with us. We appreciate the frank and open way in which they discussed their experiences and are indebted to them for the many suggestions and solutions they proposed.

This final report is tabled at a time of profound and growing concern for the environment. It is deeply disturbing to see our waters being polluted by tanker operations, especially since much of the pollution is preventable. At the same time, it is extremely difficult to recover oil or chemicals once they have been spilled into the water. Accordingly, we are emphasizing prevention. However, recognizing that as long as our society consumes petroleum products and chemicals, the risk of marine spills will remain, we are also recommending measures to provide more effective response to spills. To ensure that these recommendations are strongly supported by legislation, policy and international convention, we are proposing changes to the domestic policy framework and legislation, as well as objectives Canada should pursue in international negotiations.

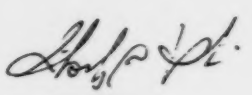
We have set out in this report what we consider to be the best solutions proposed to us. We hope that these solutions — or better ones which may yet be suggested — will be implemented as soon as possible. Much of the pollution now occurring can be prevented. It is not too late to rescue our waters and shores and return them to their former pristine state.



David Brander-Smith, Q.C.
Panel Chairman



Denise Therrien, P. Eng.
Panel Member



Stan Tobin
Panel Member

Executive summary

The Public Review Panel on Tanker Safety and Marine Spills Response Capability was appointed on June 9, 1989 by the Right Honourable Brian Mulroney, Prime Minister of Canada, in response to growing public concern for the marine environment resulting from the bulk movement of oil and chemicals through Canadian waters and fishing zones. The three-member panel was given the mandate to review and evaluate:

- the measures currently in place to ensure the safe movement of oil and chemicals by tanker and tank barge through Canadian waters;
- Canada's ability to respond to marine spills of these products;
- the Canadian and international legislation and conventions which regulate the movement of oil and chemicals, including the provisions for compensation for damages resulting from spills.

In fulfilling its mandate, the Panel held 31 days of public hearings across the country. The following are its major findings and recommendations.

Major findings

- The capability to respond effectively to a spill of any significant magnitude does not presently exist anywhere in Canada.
- Each year, based on current levels of tanker traffic, Canada can expect over 100 small oil spills, about 10 moderate spills and at least one major spill. A catastrophic spill (over 10 000 tonnes), for which we are wholly unprepared, can be expected once every 15 years.
- The risk of spills is highest in eastern Canada, particularly in Newfoundland. Placentia Bay is considered by many to be the most likely place in Canada for a major spill.
- A much greater volume of oil enters the marine environment as a result of routine tanker operations — loading and offloading, tank washings, waste water discharges — than of accidents. Almost *all* of these operational spills can be avoided.
- The overwhelming majority of tanker accidents are caused by human error. Despite this, competitive pressures have reduced manning of vessels to dangerously low levels and made quick port turnarounds a growing priority.
- Only 8 per cent of the oil tankers operating worldwide have double hulls or bottoms, despite overwhelming evidence that this type of construction offers a substantially higher margin of operational safety. Of Canada's 31 tankers, only one is double-hulled and ice-reinforced.
- Canada's tanker fleet is old and in need of replacement. The estimated life span of a tanker is 20 years, but Canadian tankers are on average older than that.
- Overall, foreign tankers pose a greater threat to our shores than domestic tankers: almost one quarter of the foreign tankers inspected by the Canadian Coast Guard in the Atlantic region over an 18-month period ending December 31, 1989 were found to be defective.

- Over 340 chemical spills occur in Canadian waters every year. The environmental and health hazards they pose are largely unknown and (in the very rare circumstances where clean-up is possible) they often cost 10 times as much, and take 5 times as long, to clean up as oil spills.
- There is also a glaring need to standardize and upgrade dockside chemical loading and offloading requirements, as well as the design, construction and inspection of chemical tankers and barges.
- A major research and development effort is urgently needed to develop more effective spill clean-up equipment and technology because what is now available is essentially primitive and largely ineffectual.
- The Coast Guard is seriously under-resourced and cannot provide the level of monitoring, inspection and surveillance required to adequately protect our waters. Despite the fact that it commits most of its inspection resources to compulsory inspection (up to 90 per cent in some regions), and that Canada is a signatory to an international agreement requiring inspection of 25 per cent of all foreign tankers entering its ports, only 8 per cent of foreign tankers are inspected.
- The Coast Guard's investigative and prosecution efforts are seriously inadequate and do little to deter polluters. Indeed, the chances of polluters being caught are small; of being caught and prosecuted even smaller. If polluters are prosecuted, the chances of being found guilty are minuscule and, if found guilty, fines are paltry. In the few instances where prosecutions are attempted and prove successful, fines are unacceptably meagre: between 1979 and 1988, the average fine under the *Canada Shipping Act* was $4,700.
- Industry relies inordinately upon the Coast Guard for spill response. To date, the amount it has invested in spill-related R&D and in response equipment has not been commensurate with the risks inherent in the loading, discharging and transportation of its products.
- While contingency plans to deal with just about every possible marine spill scenario exist in all regions, they are for the most part poorly designed, uncoordinated and untested. Too often, they are based on the mistaken belief that if things go badly the response will escalate and additional resources will simply be called in. The necessary linkages, roles and responsibilities are largely assumed and the needed equipment non-existent.
- Numerous spill reporting systems exist between and within regions, leading to uncertainty and poor coordination. It is essential that these systems be integrated and that a public education program be undertaken to encourage Canadians to get involved.
- The current international and domestic statutory frameworks relevant to prevention, preparedness, liability and compensation need to be overhauled. No less than eight separate statutes govern spill response in Canada and each has widely different limitation of liability, duty to remedy and penalty provisions (maximum fines range from $500 under the *Canada Ports Corporation Act* to $1 million under the *Canadian Environmental Protection Act*). To enforce compliance, these statutes must be streamlined, strengthened and more vigorously enforced.

Major recommendations

In response to the situation outlined above, the Panel makes 107 recommendations, of which 51 focus on specific local or regional concerns raised during the public hearings. The Panel estimates that the cost of implementing these recommendations will be approximately $1.5 billion over a 10-year period, of which $800 million to $1 billion is to be raised through a $2 per tonne levy on all oil and oil products transported in Canadian waters. Single-hulled vessels would pay the proposed levy in full and those that are double-bottomed would pay 50 per cent of it. For double-hulled vessels, the levy would be set at zero. The Panel also proposes a similar, but as yet undetermined, levy on the bulk shipment of chemicals.

In addition to providing an incentive to companies to charter only safer double-hulled vessels, and to transportation companies to purchase them, a portion of the funds raised through the levy would be used to support the replacement, or retrofitting, of the entire Canadian tanker and tank barge fleet with double-hulled vessels, by financing one fifth of the cost of double-hulled construction.

Another portion of the funds would go towards enhancing Canada's spill response capability by upgrading government-coordinated and -funded research and development into spill response technologies and supporting the establishment of major industry-operated spill response cooperatives in all high-risk areas of Canada.

In addition to the positive incentives implicit in the new levy, the Panel recommends that the entire *Canadian-flag* fleet of tankers and tank barges be double-hulled within *seven years* and that Canada require that *all* tankers and tank barges entering its waters be double-hulled in *ten years'* time.

Prevention

Other recommendations related to prevention include:

- The Canadian Coast Guard must be provided with the additional resources it requires to significantly expand its capacity to inspect foreign tankers, and ensure on-board compliance with statutory manning requirements and shift schedules.
- In cooperation with petroleum industry associations and terminal companies, the Coast Guard must develop more stringent operating and chartering guidelines for tankers.
- The Coast Guard must work closely with the chemical and shipping industries to develop: training and certification programs for tanker and terminal personnel that emphasize safety and pollution prevention; and design, construction and inspection standards for chemical barges and tankers.
- To deter polluters, the Coast Guard must deploy three dedicated aircraft (east coast, west coast, Great Lakes-St. Lawrence) equipped with the latest spill-detection and evidence-gathering technology.
- To improve its investigative and prosecution capability, the Coast Guard must deploy additional personnel, appropriate technology and equipment, and designate larger numbers of more rigorously trained Pollution Prevention Officers.
- The Coast Guard must also issue stricter regulations governing loading, unloading and transfer operations at terminals to reduce the risk of operational spills.

- To minimize illegal dumping, reception facilities for oily water and other waste must be required at all terminals and their use must be mandatory.
- A range of navigational aids, such as hydrographic charts, Vessel Traffic Services, buoys, markers and radar coverage, must be made available or upgraded in a number of regions.

Response

Recommendations pertaining specifically to spill response include:

- The Coast Guard must remain the lead agency responsible for marine spill response and this role must be clearly defined and reinforced. Under the Coast Guard's close supervision, industry must have immediately at hand the equipment and skilled personnel necessary to address the risks associated with its facilities and operations.
- Contingency plans at the facility, port, regional and national levels must be mandatory and individually reviewed and approved by the Coast Guard. These plans must clearly specify lines of authority and accountability, as well as anticipate the need to involve volunteers, native groups, municipalities and provincial officials in the response effort. The Coast Guard should be given the responsibility of preparing detailed contingency plans involving support from the international community
- for spills of a catastrophic size.
- Within one year, a comprehensive national marine spill response plan must be developed by the Coast Guard in consultation with interested parties. The plan must be submitted for government review and approval and an annual report on progress toward its implementation submitted to Parliament by the Minister of the Environment to ensure sustained commitment.
- Within each region of Canada the integrated industry-government spill response capacity must be sufficient to address marine spills of up to 10 000 tonnes, regardless of type or responsibility.
- As an immediate priority, a national chemical spill response team with representation from government and industry must be formed and it should have policy development capacity.

Legislative framework

The Panel proposes a number of ways to overhaul and streamline the existing regulations and regimes governing marine spills. In order to ensure compliance with them, the Panel recommends significantly higher fines for polluters, more generous compensation for victims of spills and more vigorous enforcement and prosecutions. The objective of these recommendations is to oblige companies to act in environmentally sensitive ways by making the cost of polluting prohibitive and the likelihood of getting caught significantly higher.

Conclusion

The Panel believes that when its recommendations are accepted and implemented Canada will be able to solve its ship-source oil and chemical pollution problem in a relatively short time and at a comparatively insignificant cost to industry, government and the public. With leadership and commitment from both the government and industry, the frequency of marine spills can be greatly reduced and Canada's capacity to respond effectively to them considerably enhanced.

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Chapter one

Our mandate

Introduction

In December 1988, the tug *Ocean Service* struck the tank barge *Nestucca* off the coast of Washington, resulting in an 875-tonne[1] oil spill that affected Canada's west coast. A few months later, in March 1989, the tanker *Exxon Valdez* grounded on Bligh Reef in Alaska, releasing 44 000 tonnes of oil. Both of these spills caused highly visible environmental damage and were followed by public outrage because clean-up efforts were slow or unsuccessful.

The growing concern for the marine environment and safety led the Government of Canada to quickly launch two initiatives. The first, a federal internal review of marine spill prevention and response capabilities, began in April 1989 under the direction of Environment Canada, in collaboration with the Canadian Coast Guard and the Department of Fisheries and Oceans. On June 9, 1989, we were appointed to conduct an independent public review that would parallel, and build upon, the results of the internal review. Specifically, our mandate[2] was to review and evaluate:

- the measures currently in place to ensure the safe movement of oil and chemicals by tanker and tank barge through Canadian waters;
- Canada's ability to respond to marine spills of these products;
- provisions for compensation for damages resulting from spills of oil and chemicals;
- Canadian legislation and international conventions which regulate the movement of vessels transporting oil and chemicals.

The review process

In fulfilling our mandate, we sought to treat the public nature of the review as conscientiously as practicable. It was essentially for this reason that we concentrated the hearings in Canada's coastal communities, rather than in Ottawa. We felt that the people in the regions most likely to suffer the consequences of spills should be given the opportunity to understand the nature of the risks and the measures being taken to minimize them. We were confident that the members of these communities would be well informed as to potential solutions to current problems — and we were not disappointed.

In 31 days of public hearings in some 23 municipalities covering eight provinces and the two territories, we heard over 225 presentations from a broad cross-section of interested groups, individuals, associations, institutes, unions, companies and government officials. The quality of the submissions was excellent and we were pleased and impressed by the willingness with which all those from whom we sought information or involvement participated and volunteered their time and, in some cases, resources.

As interested as we were in receiving expert opinion, we also wanted to know the opinions of as many individual Canadians as possible on this vitally important issue. During the hearings we therefore always made a point of leaving time for people in the audience to question those who made presentations. We also decided to place copies of the submissions, the hearing transcripts and the documentation we reviewed in locations across Canada.

Over the course of the hearings, several people made quite forceful and lucid presentations on issues outside our immediate mandate, but of crucial importance to our collective future and the health of our fragile and increasingly polluted ecosystem. That our report does not deal with such issues as energy conservation, the greenhouse effect, current federal energy policy and alternatives to fossil fuels, to name but a few, in no way diminishes their relevance. Canadian environmental patriots must be encouraged to continue raising their voices to ensure that these issues are publicly debated.

In addition to the hearings, we conducted extensive research. This included the examination of hundreds of public submissions, internal review documents and other relevant reports and publications. To gain further insight into particularly important issues, we commissioned six separate studies. All of these documents are listed in the appendices to this report. We also made a special effort to learn first-hand how other countries are dealing with the problem. This exercise proved to be invaluable; the lessons learned from the experiences and approaches of others have contributed substantially to this report.

Also very important to our deliberations, particularly with regard to the relevance and effectiveness of international regulatory systems and regimes, was the accumulated expertise and experience contained in the 22 separate reports that constitute the federal internal review. The principle of impartial review by outsiders is as valid for government as it is for industry and this was the spirit with which we assessed the internal review's substantial contribution to our efforts.

The federal internal review began with a rigorous assessment of existing spill prevention and response capability, and the public policy framework circumscribing it. Improvements to the status quo were subsequently identified. We, on the other hand, first held extensive public hearings across the country designed to capture the views of concerned individuals and organizations on these issues. The hearings then served as a frame of reference for our assessment of both the status quo and the internal review documents. Although the approaches taken in both reviews were different, they complemented each other and both had considerable merit and validity. On September 29, 1989 we submitted an interim report to the Minister of the Environment which contained a number of recommendations for immediate action, pending completion of this final report.

Our final report

Chapter 2 of our report provides an overview of the marine spills situation, while chapters 3 to 5 address prevention, response and the legislative framework. In these four chapters, we present a total of 56 recommendations related to funding and prevention and response initiatives. Finally, in Chapter 6, which examines the unique characteristics and exposure of each of the regions of Canada at risk to ship-source pollution, we make 51 region-specific recommendations.

1. Throughout this report, tonnes are used as a unit of measure. A tonne is approximately 1000 litres.
2. For the complete terms of reference, refer to Appendix B.

Chapter two

Overview and funding recommendation

Introduction

In our interim report, we emphasized the fact that most oil pollution is caused by operational spills and that the majority of these are preventable. If everyone who handles oil takes precautions and compliance with regulations is achieved by imposing stiffer penalties on polluters, the incidence of these spills will be drastically reduced. Although tanker accidents contribute much less ship-source oil pollution, major or catastrophic accidents can seriously damage the environment because they lead to a heavy concentration of oil at one place and time. The Coast Guard and industry may be able to mitigate the effects of minor and moderate spills, but man and nature are clearly overwhelmed by the major and catastrophic ones. This is the problem we were appointed to address.

Many studies have been conducted on this important issue and several compelling recommendations have been made. Too frequently though, these recommendations have not been implemented — presumably because of a lack of funding. With this in mind, we sought to suggest a means of funding at least some of the solutions we propose. Our suggestion is presented in our first recommendation, which is included in this chapter.

Frequency of oil spills

According to available research data, more than one major spill from a tanker accident will occur in Canadian waters every year. These large spills cause visible and devastating damage to the environment. We have been told by experts that they are inevitable. Presumably this is because human error, in one form or another, is the cause of most tanker accidents, and human error can never be completely eradicated. Faced with the possibility of catastrophic environmental damage, it is understandable that at the hearings Canadians questioned whether so much error really is normal. For the purpose of illustration, the Alaska Oil Spill Commission, which studied the 44 000-tonne *Exxon Valdez* spill in 1989, compared the Valdez tanker operation to the U.S. airline industry and estimated that 1.5 airplane crashes would occur every day in the United States if airline safety were no better than tanker safety. A spill of the same magnitude as that from the *Exxon Valdez* could happen at any moment in Canadian waters. Indeed, without better prevention efforts, it *will* happen.

The definition of spill sizes is a subjective, but necessary, exercise that will give some structure to the problem. We define small spills as less than 1 tonne, moderate spills from 1 to 100 tonnes, major spills from 100 to 10 000 tonnes and catastrophic spills as greater than 10 000 tonnes. (It should be noted that the impact of a spill does not depend solely

Conversion Table
(oil density of 0.9 kg/L)

1 tonne	= 7 barrels = 244.4 imperial gallons = 1111 litres
1 barrel	= 35 imperial gallons = 159 litres = 0.14 tonnes
1 imperial gallon	= 4.55 litres = 0.03 barrels
1 litre	= 0.22 imperial gallons

"We protect our country from war, we are in a war to protect our environment."

Stewart Jamieson, MLA (St. John-Fundy)

on its size: a small spill can have severe effects if it occurs in a sensitive location. On the other hand, some catastrophic spills which have occurred in distant offshore areas have not resulted in documented catastrophic effects.)

Unless the situation changes, Canada will experience over 100 small spills, about 10 moderate spills and at least one major spill every year (based on current levels of tanker traffic). A catastrophic spill — in the order of 10 000 tonnes — can be expected about once every 15 years.[1] At greatest risk is eastern Canada, where the two largest spills in Canadian waters have occurred: the *Arrow* released 9000 tonnes in 1970; the *Kurdistan*, 7000 tonnes in 1979. Spills are not rare. Indeed, in the present circumstances, *they will occur on a regular basis.*

Major and catastrophic oil spills can be of unimaginable proportions. Just recently, in 1988, the *Athenian Venture* broke up in the North Atlantic en route to Come By Chance, Newfoundland, spilling 27 000 tonnes at sea. Three of the largest spills caused by groundings worldwide were from the *Amoco Cadiz* in 1978 off the French coast (220 000 tonnes), the *Torrey Canyon* in 1967 off the English coast (117 000 tonnes) and the *Urquiola* in 1976 off the Spanish coast (88 000 tonnes). Three of the largest collision spills worldwide were from the *Atlantic Empress/Aegean Captain* in 1979 near Tobago (120 000 tonnes), the *Texaco Denmark* in 1971 off the Belgian coast (125 000 tonnes) and the *Independenta* in 1979 in the Bosporus (116 000 tonnes). Many of these spills could be prevented by improved ship design and construction. We will explore this subject further in Chapter 3.

To put these spills in perspective, the *Nestucca* spill, which caused significant visible environmental damage to the west coast of Vancouver Island in 1988, was 875 tonnes. Moreover, the "mystery spills" which killed an estimated 18 000 seabirds in Newfoundland in January 1990 were likely a fraction of the size of the *Nestucca* spill. It is clear that we must find ways to end this carnage. Our first priority must be to prevent spills from occurring, but we must also strive to learn how to effectively clean them up — something we are presently unable or unwilling to do.

Causes of spills

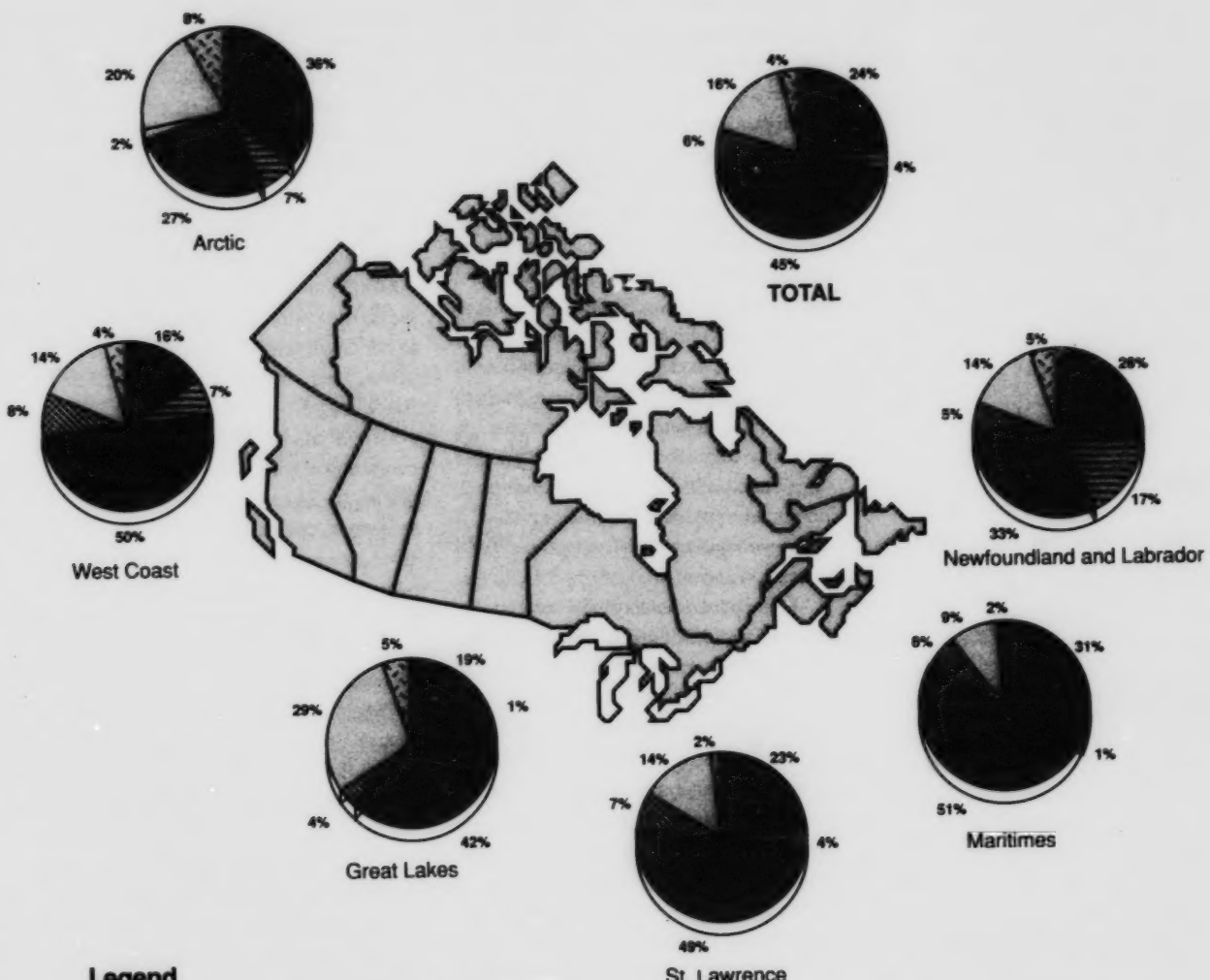
Prevention begins with people. Many technologies can be used very effectively to improve the safety of tankers, port facilities and navigation systems. These should be applied to enhance shipping safety wherever practicable. This being said, the overwhelming majority of marine accidents are directly attributable to human factors: an officer on board a vessel, or a manager at head office, may not have insisted on safe operating procedures; a fatigued captain may have ignored warning signals and objective data in making a critical decision; instruments may have been wrongly programmed, or simply not working, or their outputs accepted without question. In short, the potential for human error is unlimited.

Canadian Coast Guard statistics indicate that 75 per cent of spills are caused by human error, and this estimate is conservative compared to international data. The International Maritime Organization (IMO) estimates that over 90 per cent of marine pollution incidents worldwide are caused by human error, and a study done for the U.K. Marine Directorate by the

"The major causes of marine pollution from vessels are human error and negligence. Such discharges continue to occur despite the application of regulations, prudent operation practices and high-tech machinery. The ambition of modern man to master the world without first mastering his behaviour in relation to it remains a problem. He is employing science and technology to serve his desires without troubling greatly about the consequences and ultimate costs of his actions."

Steven M. Millan,
NorTek Engineering Inc.

Oil and Chemical Spills in Canadian Waters, by Cause



Tavistock Institute suggests that human error is responsible for 96 per cent of collisions and perhaps an equal number of groundings. Since most large spills are the result of groundings and collisions, this data should be seen by the oil and shipping industries as a call-to-arms for safer vessels and crews. Industry must view regulatory requirements pertaining to environmental protection as targets to be exceeded, not just met.

Considerable documentary evidence exists regarding inadequate crew size, poor design of shift schedules, and long shifts for officers. Many groups and organizations expressed concern about poorly designed ships, inadequate training and supervision, and other serious problems. Individually or collectively, all of these problems and shortcomings increase the risk of catastrophic spills well beyond acceptable levels. *Remedial action is required now.*

At the public hearings, we were repeatedly told that spills cannot be completely prevented — that they are inevitable. We were told that the occasional spill is simply an environmental cost of our way of life. This reasoning is unacceptable. It is an excuse for inaction, or worse, for complacency and fatalism. It assumes that we should accept the costs because there is not much we can do to reduce the risk of a spill. This does little to encourage industry and government to act. While spills may occur in spite of our best efforts, there is much that government and industry can, and should, do to reduce their risk and frequency. Accidents are only inevitable until public opinion says otherwise, and we have received a clear message from the public that marine-polluting accidents should no longer be regarded as inevitable.

"The first point is that large-scale marine oil spills are not manageable, not in any stretch of the imagination are they manageable."

William J. Schouwenburg, Association of Professional Biologists of British Columbia

Impact of spills

Aside from the environmental damage we can actually see — and this is usually considerable — little is known about the long-term or cumulative effects of major oil spills. Even less is understood about the consequences of chemical spills or of the more than one million tonnes of oil which annually enters the marine environment in smaller amounts from ship sources other than tanker accidents (which account for approximately 400 000 tonnes per year). The fact that we do not really know what we are doing to our environment, and therefore to ourselves, seems to us to be one of the more frightening aspects of the problem.

There can be no latitude for complacency about spills. Once a major spill occurs, the integrity of the natural environment is put at serious risk. All discussions about oil and chemical spills must take into account the damage that can result — even in the short term.

The environmental, social and economic consequences of spills can be devastating. Oil or chemical spills can destroy the microscopic organisms that anchor the food chain, causing extensive damage to marine ecosystems. They can seriously reduce fish stocks, either directly, or by damaging spawning areas. Waterfowl, typically the first, and most visible, casualties of spills, are especially vulnerable. Countless species of wildlife, from seals and otters to whales and polar bears, may be severely affected. In some instances, either the incident itself or the subsequent clean-up may place entire species of birds at risk of extinction if it occurs during moulting season or interferes with migration patterns. Spills can coat shorelines for years, ruining a region's tourism potential. In the Great Lakes, contamination resulting from

spills of hazardous materials can shut down the supply of drinking water for millions of people. In the immediate and short term, therefore, major spills can jeopardize the health, and the economic and social well-being of untold millions of Canadians.

Clean-up capability

Small and moderate spills can be neutralized quite effectively with existing technology, if it is applied quickly and expertly. In Chapter 4, we make recommendations to improve our ability to deal with these spills.

Present capabilities for minimizing potential damage from large oil spills, however, are seriously inadequate:

"For tanker spills and other batch spills, the recovery efficiencies are directly related to spill size. Whereas recovery efficiencies for a medium-sized tanker spill of 23 000 barrels (3600 tonnes) can be as high as 40 per cent totally recovered, with ideal weather conditions and good luck, the efficiencies decrease rapidly as spill size increases. Maximum feasible recovery efficiencies for catastrophic-sized spills in the Exxon Valdez *category (250 000 barrels or 40 000 tonnes), a main concern today, are in the 10 per cent range. No more can be done with existing knowledge, equipment and capabilities. There is some hope with respect to new concepts and technologies (e.g., in situ burning, emulsion-inhibitors), but these are only research ideas and not proven techniques."*
(S. L. Ross Environmental Research Limited, November 1989)

It should be noted that the figures cited above represent theoretical maximum recovery efficiencies; we are not aware of any spill where actual recovery efficiency even approximated 40 per cent. However, effective response is not a function of the amount of oil recovered, but of the environmental damage avoided.

Lengthy discussions about countermeasures and contingency plans often mislead government and the public about the real risks and cost of major oil spills. It is obvious from the hearings that the public does not fully appreciate the limitations of current clean-up technologies. If a major spill occurs, Canadians often expect government and industry to simply get out there and clean it up. When clean-up operations fail to meet such expectations, people automatically attribute it to shortages of clean-up equipment or complacency on the part of government and industry. In fact, in many instances, it is the lack of effective clean-up technologies which is to blame.

Major issues and funding recommendation

Our title, the Public Review Panel on Tanker Safety and Marine Spills Response Capability, is long but unambiguous; it reflects the two major questions we were appointed to answer:

- Are tankers safe?
- Are we capable of responding effectively to spills and mitigating their environmental consequences?

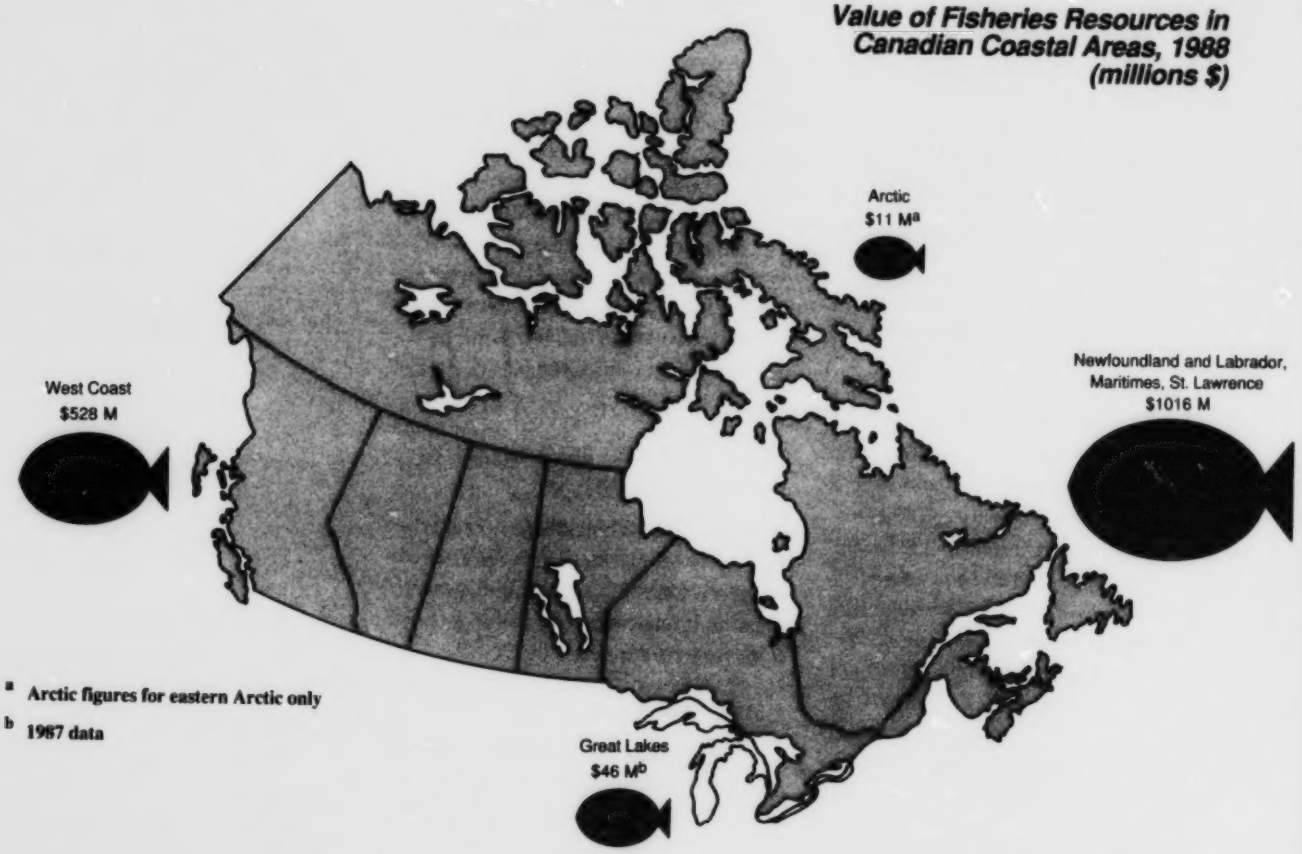
The answer to both questions is an unequivocal *NO*. Tankers are not as safe as they could be and we cannot effectively clean up large oil and chemical spills. Unfortunately, as we have seen, frequent major spills in Canadian waters are a certainty.

Today, even as this report is being written, most of the tankers plying our waters are not safe enough; if any one of them has an accident we could have a major, even catastrophic oil spill. These tankers were not designed to be environmentally safe; they allow for no margin of error on the part of crews, even though human error is so prevalent among crews and even though Canadian waters are among the most hazardous on the planet.

We must take action right now to establish as quickly as possible a process which will ensure that only environmentally safe tankers transit Canada's waterways.

Equally demanding of immediate attention is the fact that Canada is simply not prepared or able to clean up oil and chemical spills. We have perhaps one fifth of the equipment we need to be as effective in cleaning up spills as current technology allows. Unfortunately, cur-

Value of Fisheries Resources in Canadian Coastal Areas, 1988 (millions $)



[a] Arctic figures for eastern Arctic only

[b] 1987 data

rent technology is not sufficiently effective; therefore, we need to do all we can to make it so.

Substantial funding is required to upgrade ship safety, buy response equipment and conduct major research on improved clean-up technologies. In the absence of such funding, many of the major recommendations in this report would amount to a mere "wish list". We therefore view the funding mechanism which we propose below as pivotal; it is the cornerstone for turning the vision of clean Canadian waters into a reality.

We need double-hulled vessels, more oil spill response equipment, and a major research program. Indications are that these items alone will require an investment in the order of $800 million to $1 billion[2] over a period of approximately 10 years. We propose to raise that amount by means of a levy on all oil and oil products transported in Canadian waters.

Canada's Ship-source Oil Pollution Fund

The 1973 Maritime Pollution Claims Fund (MPCF) was established to provide a source of compensation additional to the rights of claimants directly against shipowners in instances of ship-source oil pollution. It was financed by imposing a 15 cent per tonne levy, effective February 15, 1972, on each tonne of oil imported into Canada by ship and shipped from any place in Canada. The levy was discontinued on September 1, 1976 by the Minister of Transport when the MPCF's balance reached $39 million. Since then, compounding of interest has brought its balance to $163 million (as of March 31, 1990).

The MPCF was developed as a stand-alone fund when Canada did not have access to the International Fund for Compensation for Oil Pollution Damage. However, when Canada acceded to the '69 CLC (International Convention on Civil Liability for Oil Pollution Damage) and the '71 Fund Convention (International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage)[3], and incorporated their provisions into the *Canada Shipping Act*, it gained access to the International Fund for payment of claims. Nonetheless, a decision was made to retain the Canadian fund, modify it in light of experience gained, and rename it the Ship-source Oil Pollution Fund (SOPF). In addition to the previous availability of the MPCF to cover lost income of fishermen and clean-up costs, the SOPF is available for:

- use as an "excess fund" to cover any portion of claims exceeding the funds available under the '69 CLC and the '71 Fund Convention, to a maximum of $100 million (indexed to $105.5 million in 1990) per incident;
- meeting claims that might not be covered by the International Fund, which applies only to laden tankers. (The Canadian fund covers spills from any ship. In the case of "mystery spills", the onus is on the fund's administrator to show that the spill did not come from a ship.);
- meeting claims against a shipowner who is financially incapable of paying the limited liability portion of the damages;
- meeting claims resulting from oil pollution damage suffered outside the territorial sea, but within Canada's fishing zones;
- paying Canada's contribution tc the International Fund.

"For a major oil spill to take place in Placentia Bay, or any other large bay, it would take years for the negative effects to go away."

Earl Johnson,
Come By Chance Area
Regional Fishermen's Committee

The amendments to the *Canada Shipping Act* which came into force in 1989 also increased the amount of the levy and indexed it, so that if imposed today, it would be 31.65 cents per tonne.

Recent experience demonstrates clearly that the $163 million now in the SOPF is not adequate to deal with a major spill. Collection of the 31.65 cent per tonne levy last year would have raised more than $12 million, in addition to the interest earned by the Fund. Nonetheless, given the demands which the Fund may be called upon to meet, and those which we propose to add, the levy should initially be raised to $2 per tonne. The Minister of Transport has the authority to impose the levy at any time. In our view, this should be done at once and the purpose of the fund should be expanded to include both prevention and response measures.

Specifically, the SOPF levy should be used to:

- encourage the replacement of the Canadian-flag fleet of tankers and tank barges with safer double-hulled ships (see Chapter 3);
- provide an incentive for companies that charter foreign tankers to use double-hulled or double-bottomed tankers in Canadian waters by discounting the levy for safer ships (see Chapter 3);
- launch and sustain a major Canadian research initiative aimed at learning more about the effects of oil and chemical spills and developing effective spill clean-up technologies (see Chapter 4);
- fund the acquisition of clean-up equipment to a level five times that of existing inventories (see Chapter 4);
- increase the amount in the fund for its original purpose — oil spill clean-up;
- provide a source of funding to facilitate immediate response to spills.

This proposal has several implications. First, we know that ultimately the levy may be passed on to consumers; all Canadians could be bearing part of the price for safer ships and improved response capability. This price is estimated to be a fraction of a cent per litre of fuel. Second, the levy will support the replacement, or retrofitting, of the entire Canadian tanker and tank barge fleet with double-hulled vessels, by financing one fifth of the cost of double-hulled construction. Further, in view of the fact that this levy may ultimately be paid by Canadian consumers, our preference is that the new double-hulled tankers and tank barges be built in Canadian shipyards, thus providing economic benefits to Canada.

The SOPF levy has a built-in "sunset" mechanism. As single-hulled tankers and tank barges are replaced by double-hulled vessels and spill response equipment requirements are satisfied, the levy will be eliminated. Our expectation is that over the seven to ten year period, the additional amounts raised by the levy, with compounded interest, will be sufficient to meet all of the objectives we set for the SOPF. (In this context it should be noted that there is a worldwide move towards safer tankers.) We anticipate that there will be reasonable coincidence between the complete funding of the SOPF objective of clean waters and the disappearance of the levy.

In view of the environmental risks inherent in the bulk movement of chemicals by tanker and barge, and since the chemical industry stands to benefit from the ameliorations in regional and national response capacity that will result once the SOPF levy is imposed, the chemical industry must contribute to the maintenance of this improved capacity. We are making a recommendation to this effect in Chapter 5.

Finally, while $800 million to $1 billion may appear to be a substantial amount, we believe it is justifiable and reasonable, given the potential pay-off in terms of preserving our marine environment. It is half the cost of one unsuccessful clean-up operation. (It is estimated that, to date, Exxon has spent $2 billion to clean up less than 10 per cent of the oil from the *Valdez* spill.)

Recommendation 2-1

The Minister of Transport should immediately impose a levy of $2 per tonne on all oil and oil products transported in Canadian waters. The levy should be paid into the Ship-source Oil Pollution Fund, whose purpose should be expanded to expedite replacement of the Canadian-flag fleet with double-hulled vessels and to fund spill response research and equipment purchases.

1. Analysis and calculations by S.L. Ross Environmental Research Limited. Additional data from the U.S. Coast Guard.
2. All financial figures in the report are expressed in Canadian dollars, except where indicated otherwise.
3. Both conventions are described in Chapter 5.

Chapter three

Prevention

Introduction

There is much room for improvement in the prevention of tanker accidents. In this chapter we will explore several aspects of this issue. First, we will consider prevention in general under four headings: Safe Ships, Inspections, Competent Crews and Safe Navigation. We then examine operational spills and discharges. More oil enters the marine environment as a result of these small "chronic" spills than of tanker accidents. Although we have less definitive evidence of operational spills and discharges, many people believe them to be an even greater threat to the environment than tanker accidents and are concerned that we won't have positive proof of their effects until it is too late. To conclude the chapter, we will take a closer look at chemical spills, an issue about which little is known because they are seldom detected.

Safe ships

The bottom, sides and main deck of a ship are called the hull. Many ships are constructed with double bottoms or double hulls for operational reasons: if a ship were to ground or collide, the outer bottom or side might be penetrated while the inner structure would likely remain intact. In spite of this, less than 500 of the 6 565[1] oil tankers operating worldwide have double bottoms or hulls. There are two main reasons for this: double-bottomed and double-hulled vessels cost more to build and the additional bottom/side leaves less room for cargo, reducing the profitability of each voyage because less oil can be transported.

Profitability, however, has an environmental price. A U.S. Coast Guard study estimated that if the *Exxon Valdez* had been double-bottomed, 60 per cent less oil would have been spilled. Later studies by naval architects and engineers placed this figure closer to 75 per cent. In the Baltic Sea, where navigating conditions are similar to those in Canadian waters, many of the tankers in service since the seventies have had double bottoms or double hulls. Casualty records in the Baltic, based on studies of 20 accidents over a 25-year period, show that 10 per cent of the accidents involving tankers with double bottoms or double hulls in which the shell plating was fractured resulted in oil spills. The same studies show that had those tankers had only single bottoms or hulls, 80 per cent of the accidents would have resulted in spills.

At the public hearings, many people encouraged us to recommend double hulls for oil tankers. This important issue has been studied exhaustively since the seventies, when double hulls were first proposed, and it is gaining considerable support. Both houses of the U.S. Congress have tabled legislation supporting, at least in principle, double hulls for oil tankers.[2] The Alaska Oil Spill Commission also recommended that "double hulls and other technological advances in tanker design should be required on an accelerated timetable, including prohibition of non-qualifying vessels, regardless of flag registry, in all U.S. waters." Finland passed a law, effective January 1990, requiring operators of single-bottomed tankers to pay a higher levy into a fund[3] to combat oil pollution than operators of double-bottomed tankers. Scandinavian countries are now consid-

"It is interesting to note that neither the federal nor provincial governments, and I include the opposition parties, have [chastised] the oil companies for quality of vessels, crews or safeguards they employ in the transportation of oil, a substance capable of poisoning the oceans on which it's carried."

John Fletcher, Island Trust

"Most of the large tankers are over 15 years old, and the reason that they have not been replaced is because the freight rates are so low that the ship really is not earning its keep . . ."

Bill Scott,
Canadian Coast Guard

ering requiring that all tankers entering their ports have double hulls. Furthermore, on a recent visit to Valdez, the head of the Organization of Petroleum Exporting Countries (OPEC), General Subroto of Indonesia, also voiced support for double-hulled tankers.

We have heard the arguments against double bottoms and hulls, but from discussions with Canadian shipowners we conclude that the concerns expressed can be overcome. We were advised that double bottoms and hulls could prevent the break-up of a grounded tanker because of their greater structural strength. They would also have greater structural integrity, making them better able to withstand the rigours of Canadian waters.

A double-hulled tanker has two layers of steel between the oil and the sea, with the intermediate space used for stiffening members and segregated ballast. Interior cargo tank surfaces are free of structural members, making cleaning faster, more thorough, and far more efficient. As a result, there are fewer sludge deposits, as well as reduced coating, better heat insulation and improved operational efficiency. Ballasting and deballasting can also be done concurrently with the transfer of cargo, greatly reducing cargo loading and unloading times and further increasing efficiency.

All of this is supported by the operational record in the Baltic Sea (cited above), which provides strong evidence that double bottoms and hulls do limit pollution from groundings and collisions. As stated above, the U.S. Coast Guard conducted a series of experiments using computer models to recreate the grounding of the *Exxon Valdez* on Bligh Reef. Engineers designed a double-bottomed vessel with the same hull shape, cargo capacity and segregated ballast as the *Exxon Valdez*. These studies have shown that if the *Exxon Valdez* had been double-bottomed with 11.5 feet (3.5 metres) between the two layers of steel, 60 per cent less oil would have been spilled. In other words, over 26 000 tonnes of oil could have been saved from the 44 000-tonne spill. While double bottoms might add 5 per cent or more to the cost of a tanker (about $6 million in the case of the *Exxon Valdez*, a $125 million vessel), the potential clean-up savings make them cost-effective. Recent estimates indicate that it cost in excess of $2 *billion* to clean up less than 10 per cent of the *Exxon Valdez* spill.

It is evident to us, after examining all the research and opinions, that, as a matter of policy, Canada should strive to replace its fleet of tankers and tank barges with double-hulled vessels within 7 years.

The Canadian-flag fleet consists of 31 tankers and several dozen tank barges — all of which are in need of replacement. The estimated life span of a tanker is 20 years, but Canadian tankers are on average older than that. It will be difficult for Canadian shipowners to replace the entire fleet of oil tankers and tank barges with double-hulled vessels. The costs involved will amount to a penalty which no other country has been willing to impose upon its shipping industry. Without financial assistance, such a penalty could deal a severe blow to the Canadian fleet's competitive position, resulting in increased reliance upon foreign tankers, which may be even less safe.

Canadian tankers and tank barges carry only a fraction of the oil that passes through Canadian waters. In 1989, foreign tankers, the overwhelming majority of them single-skinned, carried most of the 40 million tonnes of persistent oil (as opposed to the lighter, more easily dispersed refined product) that were shipped

into Canadian ports. The vast majority of foreign tankers do not have double bottoms or double hulls. Moreover, in the 18 months prior to December 31, 1989, of the 86 foreign incoming tankers inspected, 19 (or about one quarter) were found to be defective. Such statistics do nothing to allay the fears of the many people who expressed concern that tanker owners have little regard for safety.

In order to have safer ships in our waters, it is tempting to recommend that Canada pass legislation banning single-skinned tankers from entering Canadian ports. However, it is apparent that we could do ourselves more harm than good by unilaterally requiring, in the short run, that only double-hulled tankers transit our waters. Because Canada accounts for such a small proportion of international trade in petroleum products, foreign-flag tankers might simply avoid Canadian ports. This would not only inflict economic losses, but could conceivably lead to disruptions in supply. The extent to which we are constrained from acting unilaterally in this area is discussed more fully in Chapter 5.

However, as a panel concerned first and foremost with environmental safety, we are committed to having safer ships in our waters. Based on the hearings, we believe that most Canadians share the same commitment.

Having considered the various alternatives, we have concluded that there are several issues that must be resolved. First, notwithstanding the cost, we must replace the Canadian fleet which services our sensitive inland, Arctic and coastal waters. For reasons of safety, we want double-hulled vessels built to more rigorous Canadian standards and manned by Canadian crews familiar with these waters. Second, we want to encourage the use of double-hulled foreign tankers in Canadian waters. We are proposing to accomplish these two objectives (and several others) by means of a levy to be applied against all oil and oil products transported in Canadian waters, as described in Chapter 2.

With respect to the replacement of the Canadian fleet, we are suggesting that a portion of the $2 per tonne levy we recommend be used to assist owners o Canadian-flag tankers and tank barges in making their vessels double-hulled within seven years. This will in turn encourage charterers to use the safer Canadian fleet. The total assistance required to make this upgrading to double-hulled vessels economically viable will be one fifth of the estimated cost — a figure the shipping industry acknowledges as being the minimum necessary.

To encourage the use of double-hulled tankers, we propose that the per-cargo-tonne levy reflect the risk that various types of vessels pose to the environment and the costs of marine spill prevention and preparedness. Conventional single-hulled vessels should pay the full levy and those that are double-bottomed should pay 50 per cent of it. The levy should be set at zero for double-hulled vessels. Based on Finnish studies (the Finnish levy is $1.50 per tonne), these discounts would appear to provide a significant incentive for the use of double-bottomed and double-hulled tankers. The amount raised by the levy for these purposes will decline as the number of double-hulled tankers increases and once all oil in Canada is carried in double-hulled vessels.

As noted above, to require that all vessels entering Canadian waters be double-hulled could lead to economic losses and disruptions in supply because

"But you know that at any one time there's a half inch of 20-year-old steel separating you from a major disaster."

Terry Pittman,
Harbour Pilot

foreign-flag tankers might simply choose to avoid Canadian ports. Foreign oil exporters and shippers may find it more suitable to do this than to build double-hulled tankers just for the Canadian trade because Canada accounts for such a small portion of their market. However, as we also indicated, legislation in support of double hulls has been tabled in both houses of the U.S. Congress. If the U.S. passes legislation making double hulls mandatory in its waters, economic and supply problems would be resolved. In any event, Canada should require that all tankers and tank barges entering its waters be double-hulled within 10 years. If the U.S. legislation requires that tankers in U.S. waters be double-hulled in a shorter timeframe, Canada should adopt the shorter timeframe.

Recommendation 3-1

Sufficient funds from the Ship-source Oil Pollution Fund (SOPF) be allocated to finance one fifth of the cost of replacing the Canadian-flag fleet with double-hulled, ice-strengthened ships over a seven-year period. It would be preferable for the new vessels to be constructed in Canadian shipyards.

Recommendation 3-2

- *To promote the use of double-hulled vessels, the per-tonne levy on oil carried in Canadian waters be discounted 50 per cent for double-bottomed vessels and set at zero for double-hulled ones.*
- *Canada should require that in 10 years' time all tankers and tank barges entering its waters be double-hulled.*

"My recommendation on this matter is that the national inspection force should be doubled and the classification inspector force should be increased by tenfold, internationally."

Joe Shormann,
Nutak Horizons Inc.

Inspections

Coast Guard inspections

The value of tanker inspections is illustrated by the 1987 *Dodsland* incident. If the structural weakness of the newly built British vessel carrying 68 000 tonnes of crude oil had not been reported to the Canadian Coast Guard at the urging of its pilot, a catastrophe may well have occurred in the Gulf of St. Lawrence.

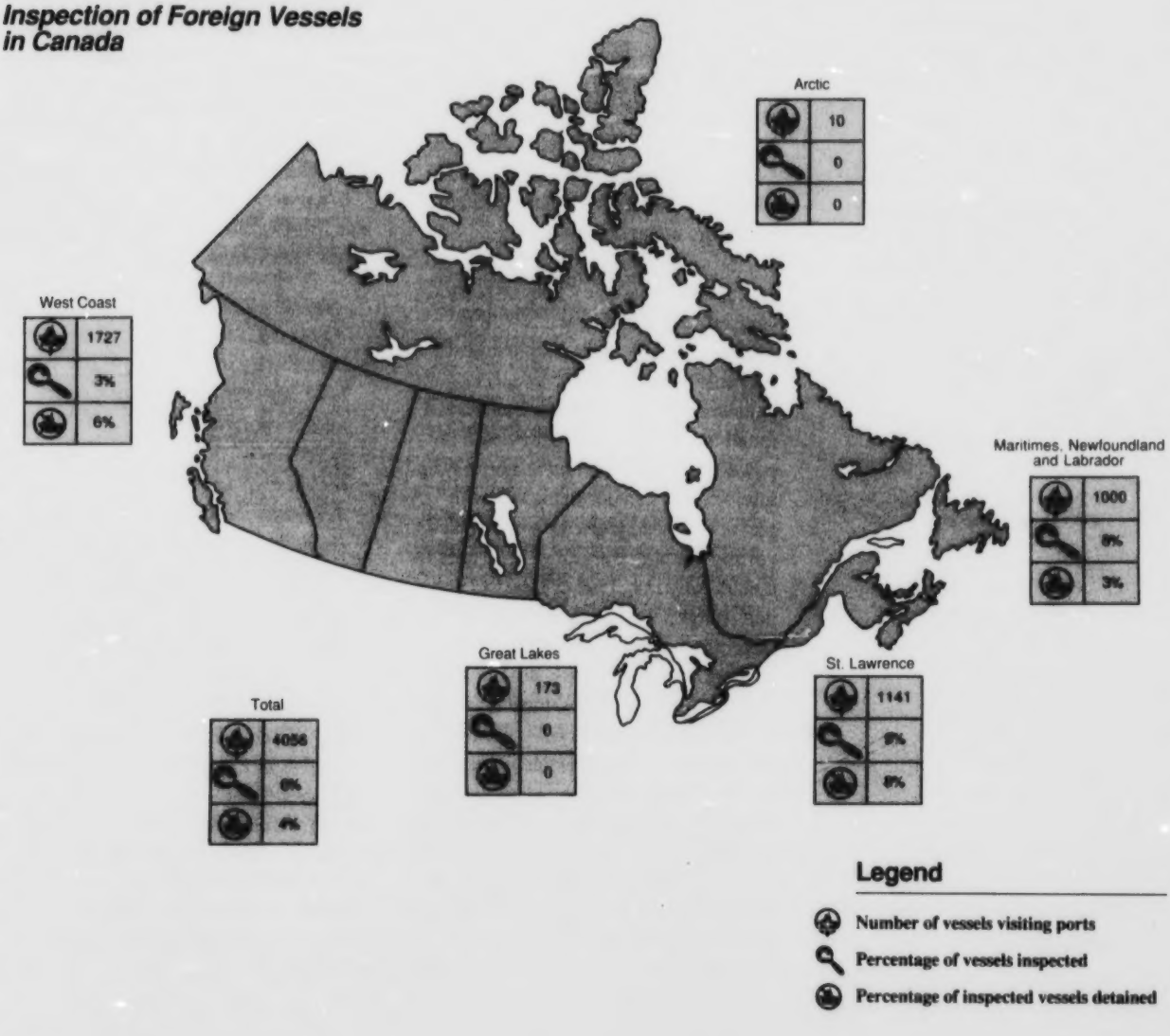
Given the inherent risks of transporting oil and chemicals in Canadian waters, it is imperative that all tankers, both Canadian and foreign, be seaworthy at all times. With cost-cutting in the shipping industry, planned preventive maintenance and inspections risk becoming less of a priority to tanker owners. Tankers with aging and deteriorating structures and equipment are an unwelcome invitation to disaster. This can only be averted by aggressive vessel inspections and prompt detention of tankers in port for repairs when they do not meet Canadian or international standards for seaworthiness and pollution prevention.

In 1988, the Coast Guard inspected only eight per cent of the foreign vessels entering Canadian ports. According to the Coast Guard, most of its inspection resources (up to 90 per cent in some regions) are presently committed to conducting compulsory inspections. Under the Memorandum of Understanding on Port State Control, to which Canada is a cooperating party, Canada is now committed to inspecting 25 per cent of all foreign tankers visiting Canadian ports. (The results of these inspections will be stored in an international data base and

shared with European nations, who will also inspect 25 per cent of foreign tankers visiting their ports. The objective is to inspect virtually all tankers annually and produce an up-to-date data base on those operating in Canadian and European waters, so that problem tankers may be identified.)

There is significant concern that the Port State inspections regime could lead to extremely inadequate inspections in Canada. This is clearly inevitable unless the Coast Guard hires and trains additional inspectors. We heard from the Company of Master Mariners of Canada, among others, that there are not enough inspectors to meet the 25 per cent Port

Inspection of Foreign Vessels in Canada



State objective. Additional inspectors must be hired and trained so that Port State inspection does not become a mere rubber stamp for substandard tankers. *Quality of inspections must not be sacrificed for quantity.*

Many countries delegate ship inspections to classification societies. Often, these countries are flag-of-convenience registries chosen by shipping companies to reduce costs and regulatory controls. There is great concern that the inspections performed by these countries and by certain classification societies are not as rigorous as those of Port State nations. The Halifax and Cape Breton Pilots, for example, state that "more often than not, a marginal ship, from a pilot's point of view, flies a flag of convenience . . ."

If *Canada Shipping Act* regulations are rigorously enforced, ship inspections, coupled with ship detentions, will be powerful incentives for ship maintenance. Where significant deficiencies in tanker condition or seaworthiness are found, Coast Guard inspectors have the power to deny a tanker an inspection certificate. They can detain the tanker in port until any deficiencies are remedied, costing shipping companies thousands of dollars daily in operating expenses and port charges. Thorough and aggressive inspections, and detentions of any violators, are strong deterrents, serving notice to owners of substandard tankers — and to those who charter them — to keep their vessels out of Canadian waters.

At present, as confirmed by the Auditor General of Canada, Canadian ship inspectors are inclined to use moral suasion rather than detention as a means of securing compliance, because of the high cost to owners of detaining vessels. This is not acceptable. We believe that Coast Guard inspectors must be much more aggressive in detaining tankers for non-compliance, particularly in the case of repeat offenders. Tanker owners and masters will only respect Canadian and international regulations if they respect the strictness of Canadian inspectors.

The petroleum industry, pilots, the Coast Guard and others who participated in the hearings made strong statements about the need for routine inspections of oil and chemical tank barges. At present, there is minimal inspection of these vessels, despite the large quantities of oil and chemicals they carry in sensitive coastal areas.

Recommendation 3-3

In order to reduce the threat of pollution from substandard tankers and tank barges, the Canadian Coast Guard:

- *inspect every foreign tanker on its first visit to a Canadian port;*
- *immediately increase inspection levels to 25 per cent of foreign tankers, in accordance with the Port State agreement;*
- *significantly increase tank barge inspection levels;*
- *apply the strictest interpretation to all regulations related to vessel condition and seaworthiness, and detain substandard vessels as a deterrent.*

The implementation of this recommendation will place significant new responsibilities on the Ship Safety Branch of the Canadian Coast Guard. Funding will be required for hiring and training additional inspectors. We believe, however, that these expenditures will reduce the risks and frequency of tanker accidents, as well as the enormous costs which result.

Inspections of chartered tankers

The shipping industry, and petroleum companies that charter tankers, have vital and central roles to play in vessel inspections. The petroleum industry has indicated a willingness to screen out substandard tankers because shipping accidents increase the regulatory burden for the whole industry. Petroleum and terminal companies which charter tankers must make stricter pre-charter inspections part of their charter arrangements and refuse to charter tankers that do not meet their inspection standards. Further to this aim, the Canadian Petroleum Products Institute made the following commitment:

"Member companies will use international tanker data to screen foreign-flag tankers for quality, equipment, history and management, to eliminate substandard tankers from Canadian trade."

This excellent initiative will go a long way towards eliminating substandard tankers, especially those registered with flags of convenience to avoid meeting high standards.

There have been suggestions by some Coast Guard personnel, pilots and others that government ship-riding inspectors should be hired to evaluate the competence of tanker crews, especially for flag-of-convenience tankers. This would allow scrutiny of the tanker in operation as opposed to sitting at dockside. We support the idea of ship-riding inspectors and other spot checks in principle, but we believe that this should be carried out by those who charter tankers: they should insist on the right to carry out such inspections as a condition of chartering. Moreover, inspections should be conducted on a random basis and without forewarning.

Recommendation 3-4

In order to ensure that chartered tankers meet rigorous vessel, equipment and crew standards, petroleum industry associations and terminal companies be required, in consultation with the Canadian Coast Guard, to:

- *develop stringent, revised guidelines for the selection of tankers to be chartered for operation in Canadian waters;*
- *incorporate strict and independent pre-charter and pre-loading inspections and screening into the chartering process;*
- *deploy ship-riding inspectors on chartered vessels on a random basis.*

Competent crews

Because human error is responsible for up to 90 per cent of all marine casualties, prevention of accidents must obviously focus on human factors. We believe that certification, training and manning are all areas where policy and practice have not kept pace with changing technologies and cost-cutting trends in the shipping industry. As a result, there may well be a serious deterioration in the quality of personnel manning the vessels of some shipping companies.

Training and more experience in important tanker and terminal operations are the most promising ways to reduce human error. It is essential that efforts be made to attract highly qualified people to the marine industry and provide them with the best possible training. Apart from basic seamanship training in maritime training schools and training vessels, seafarers learn most of their trade on the job.

"We believe that further review should be given to require the owners of oil cargoes to more cautiously consider the [vessels] they charter to move such cargoes. We believe that under the existing circumstances the oil owners are simply interested in the 'best price'."

Captain Keith Jones,
Gulf Canada Resources Limited

"It would be futile to indulge in massive, expensive reconstruction to Canadian and world tanker fleets if the crews were not as well trained and knowledgeable in all aspects of tanker operations as possible."

Norman Hall,
Canadian Shipowners Association

To establish international standards in this area, the International Convention on Training, Certification and Watchkeeping for Seafarers, 1978 (STCW Convention) was developed under the auspices of the International Maritime Organization. Canada ratified the STCW Convention in 1988 and draft legislation and regulations are being processed. The Convention contains provisions for certification of tanker masters, officers and crews to perform specialized tasks related to the transportation of oil and chemical cargoes.

In Canada, certification is a federal responsibility regulated by the *Canada Shipping Act*, which prescribes requirements for certificates of competence for masters, mates and engineers on Canadian vessels. There are several levels of certification for each category, corresponding to the level of competence and the qualifications of the person for undertaking various functions, such as watchkeeping. Once Canada implements the STCW Convention, it will have to ensure that its examinations and certification standards are consistent with international requirements.

Canadian Coast Guard certification programs for shipmasters and officers do not include adequate testing and training of candidates in marine pollution prevention and pollution response techniques. There is a major need to upgrade certification requirements for masters, officers and crews for marine pollution prevention. In Canada, a certified "tankerman" is required on tankers for all oil product transfer operations, but the rest of the crew is not required to have a background in handling these products unless they take part in cargo handling operations, which all masters and officers generally do.

The curriculum related to marine pollution prevention and environmental protection at marine training institutes is not extensive and a limited amount of time is devoted to spill response training. Curricular material related to spill prevention, environmental protection and spill response needs to be expanded, and the amount of classroom time and number of practical exercises devoted to these subjects increased.

Recommendation 3-5

To improve the level and extent of training provided to Canadian seafarers, the Canadian Coast Guard introduce amendments to certification regulations to:

- *strengthen Marine Emergency Duties training requirements for masters and officers of all vessels by including environmental emergency training;*
- *allow it to work with marine training institutes to upgrade basic training and certification programs in oil and chemical products transportation and handling, including spill prevention and response and environmental protection.*

The Company of Master Mariners of Canada advised us that crew fatigue due to inadequate manning is the most significant cause of accidents resulting in pollution. Apparently, economic pressures are placing severe constraints on the hiring of tanker masters, officers and crews. Several concerns have been raised about poor manning practices on tankers in Canadian waters, including under manning, overwork and long hours, resulting in fatigued crew members being in charge of risky operations in inclement weather.

Crew sizes on vessels, including tankers, have decreased dramatically in recent years. As a result, some masters, officers and crews put in many overtime hours and are overworked. In some cases, vessels are undermanned for certain operations. Overwork and shift arrangements often mean that crews do not have adequate time for recreation and diversion. Due to rapid turnaround times at ports, they often do not get off the ship, and this contributes to "voyage fatigue". Pilots repeatedly told us that masters of undermanned vessels are afraid they will lose their jobs if they complain about crew fatigue.

Shift schedules for tanker personnel create some situations where fatigued crews must manage dangerous and complex unloading and loading operations. Tanker crews, particularly the master and first mate, may work very long hours unloading and loading tankers during short port calls. We have even heard of cases where work continued for 40 hours without a break.

Canadian Safe Manning Regulations specify minimum periods of rest for vessels over five tonnes. According to the federal internal review conducted in 1989, these regulations permit 18 hours of work in any one day period, 32 hours in two days and 48 hours in three days. Knowledgable Coast Guard officials stated at the time of the internal review that these limits do not allow for adequate rest for tanker officers involved in high-stress and high-risk operations such as arrival, loading and departure. We agree. The regulations simply do not provide for enough rest for crews performing vital bridge and transfer functions.

There is also good evidence that even the existing Safe Manning Regulations are not enforced. Tanker masters and officers report that they work shifts which would contravene these regulations. While the Coast Guard advises that there have been no complaints about long work shifts, inspectors seldom check ship logs for compliance with regulations pertaining to rest. It is clear that the Coast Guard has shown little interest in enforcing existing regulations pertaining to periods of rest. This attitude is putting our coasts at risk of a major spill.

As for substance abuse aboard tankers, we did not attempt to ascertain the gravity of the problem. The recent study conducted by Transport Canada suggests that substance abuse is no more prevalent among people who hold sensitive positions in the transportation sector than in the general population.

We know that random drug testing is a thorny issue viewed by many as a draconian measure. Nonetheless, we strongly endorse the recommendations made in the Transport Canada study and, as a minimum, support mandatory drug testing for marine staff in the following circumstances:

- as a condition of employment;
- as part of regular medical checkups;
- immediately following an accident.

Furthermore, sensitivity training courses on the subject must be developed for Canadian marine officers and crews.

Recommendation 3-6

In order to reduce the risk of operational spills resulting from undermanning or fatigue, the Canadian Coast Guard:

- *increase the level of vessel inspection and ensure stricter enforcement of existing Canadian and international regulations concerning manning, shifts and rest periods for masters, officers and crews of oil and chemical tankers, and tugs towing oil and chemical tank barges, in Canadian waters;*
- *review Canada's Safe Manning Regulations to ensure that adequate provisions are in place to regulate manning levels, shift schedules and rest periods for masters, officers and crews;*
- *issue regulations to provide that only individuals who are not members of a ship's crew, and who have been trained in tanker and barge unloading, loading and transferring operations, be responsible for such activities in Canadian waters.*

Safe navigation

Many of Canada's inland and coastal shipping routes are lengthy, constricted and subject to strong currents and tidal flows. Fog and inclement weather may reduce visibility to zero along coastal routes and severe storms can make navigation virtually impossible. In only a few areas of Canada, such as the West Coast, are navigable waters ice-free throughout the year. Elsewhere, ice-infested waters may affect navigation for periods ranging from a few weeks to the entire year.

To address the challenges of navigation in Canadian waters, Canada has developed an extensive infrastructure and a range of services, including hydrographic charting, fixed navigational aids, Vessel Traffic Services, radio stations and pilotage services. The objective of this system is to facilitate navigation in Canadian waters — an activity fraught with risks and necessitating tough judgments. It is designed to minimize the risks and help crew members make informed judgments.

Hydrographic charts

Hydrographic charts are prepared by the Canadian Hydrographic Service (a division of the Department of Fisheries and Oceans). They provide information on, among other things, water depths, known hazards, aids to navigation and topography. Canada should have the best possible hydrographic charting for all waters along tanker shipping routes.

Hydrographic charting for Canada's coastal waters is incomplete. Some charts are based on surveys conducted as early as the 1930s; they are out of date, unreliable for shipping, and inadequate to support clean-up logistics in the event of an oil spill. Only about 20 per cent of Arctic waters have been charted to modern standards. On the east and west coasts charting of portions of active tanker routes is incomplete and in some cases out of date. For example, charts are inadequate for the St. Lawrence estuary and Labrador.

Hydrographic charting is likely to undergo a major transformation in the next decade as the use of electronic charts increases. The technology and supporting infrastructure for electronic charting is not yet mature, but it is rapidly developing. Computer-generated electronic charts integrate information from radar, satellites and other position-fixing systems on a single screen to plot a ship's course relative to hydrographic information (e.g., depths). They plot the location of other ships and can activate alarms when a vessel is on a grounding or collision course.

No country has yet established a comprehensive electronic charting system. Canada can, and should, take a leading role in this area; we have the technological capability and our coastline is one of the longest in the world. Implementation of such a system would require that existing charts be converted to electronic data and that the Canadian Hydrographic Service certify the accuracy of the information. After the *Arrow* wreck, Canada provided leadership in requiring that foreign vessels carry Canadian charts. We believe it is time to exercise this type of leadership again. Requiring the use of electronic technology on tankers is an important first step towards wider use by all merchant vessels.

At present, all vessels are required to comply with the Canadian Chart and Publications Regulations which, among other things, require them to carry Canadian charts, or the equivalent, and other publications while in Canadian waters. However, many foreign tankers entering Canadian waters are not complying with these regulations. (We were advised that a few of these violations were serious when coupled, for instance, with faulty radar.) The Newfoundland Region of the Coast Guard indicates that Canadian charts are not readily available abroad and that mariners are not always aware of Canadian requirements. We also understand that some cargoes are sold after the tanker leaves a loading terminal and that the destination may not be known until after the ship is underway. Regardless of the reason, we believe that it is irresponsible and negligent for a vessel to approach our shorelines without adequate charts.

Recommendation 3-7

In order to reduce the risk of accidents, the Canadian Hydrographic Service:

- *accelerate its program to upgrade hydrographic charts focusing on tanker and resupply routes, with priority given to areas where charting is presently incomplete or out of date;*
- *expedite development of electronic charting technology and the required infrastructure, then introduce regulations requiring the use of electronic charts on all tankers in Canadian waters;*
- *take measures to ensure that adequate supplies of charts are conveniently available at usual departure ports of ships destined for Canada.*

Canada's system of fixed navigational aids is one of the most extensive in the world. It consists of both short-range aids (buoys, beacons, lights) and long-range aids (Loran-C). The purpose of these aids is to provide vessels with the necessary information to fix their location and plot their course. This system dates back to colonial times and has evolved with experience over many years.

The Coast Guard and industry state that short-range visual systems (e.g., lights, buoys) are generally adequate in most Canadian waters. Nevertheless, the Coast Guard has recommended a few minor improvements for some remote tanker routes, such as around Newfoundland, in accordance with recently established service standards. The reliability of short-range aids should not be overestimated though. Their visibility can be affected by weather. The problem is

"The problem was, there are two systems of buoyage in the world, and the master was confused as to what a red buoy meant. The red buoy, in Europe, means something different to a red buoy in Canada."

Captain Alan Stockdale,
The Halifax and Cape Breton Marine Pilots

particularly acute in the winter in areas such as the St. Lawrence, where buoys can disappear under the ice.

New navigational support systems are continually being developed, including electronic charts, advanced radar, electronically integrated vessel navigation systems, and satellite navigation and communications systems. Such systems have the potential to significantly improve the reliability and accuracy of vessel navigation. An example is the RANAV system, developed by Offshore Systems Limited and now being tested at Port aux Basques, Newfoundland. This system uses passive radar reflectors, coupled with ship-board radar and the PINS 9000 (Precise Integrated Navigation System), to provide an accurate running plot of a ship's location in all weather conditions. The Coast Guard is presently evaluating the feasibility of the system in the St. Lawrence, and Atlantic Richfield has studied such a system for access to its Cherry Point terminal in Washington State. It is essential that systems such as these be incorporated into navigation support systems as soon as their reliability and availability is confirmed.

With the introduction of the Global Positioning System, a satellite navigation system, in 1991, there will be a major improvement in navigation technology. The Coast Guard strongly supports the implementation of this system, which will provide vessels with highly accurate real-time position-fixing capability.

Recommendation 3-8

In order to ensure maximum navigational safety, the development and implementation of long-range navigation systems should be adequately funded and expedited.

Vessel Traffic Services

Vessel Traffic Services (VTS) are the highest level of vessel traffic monitoring. Shore-based VTS centres are staffed 24 hours a day at several locations throughout Canada, gathering information on ship movements and navigation hazards through radar, VHF and radio communications with ships. They exchange information on a timely basis with ships travelling within VTS zones, in order to reduce the risk of collisions and groundings — the most frequent causes of large oil spills.

VTS centres gather and disseminate information on the identity, intentions, course and speed of incoming and outgoing ships in their zones. They analyze the positions of vessels and the hazards they might encounter, so as to determine the risk of collision or grounding. The centres also identify navigation concerns, such as weather and sea conditions, ice, small-craft traffic and other factors affecting the sea lanes. Relevant information is then communicated to ships, and these are subsequently monitored to ensure appropriate reaction.

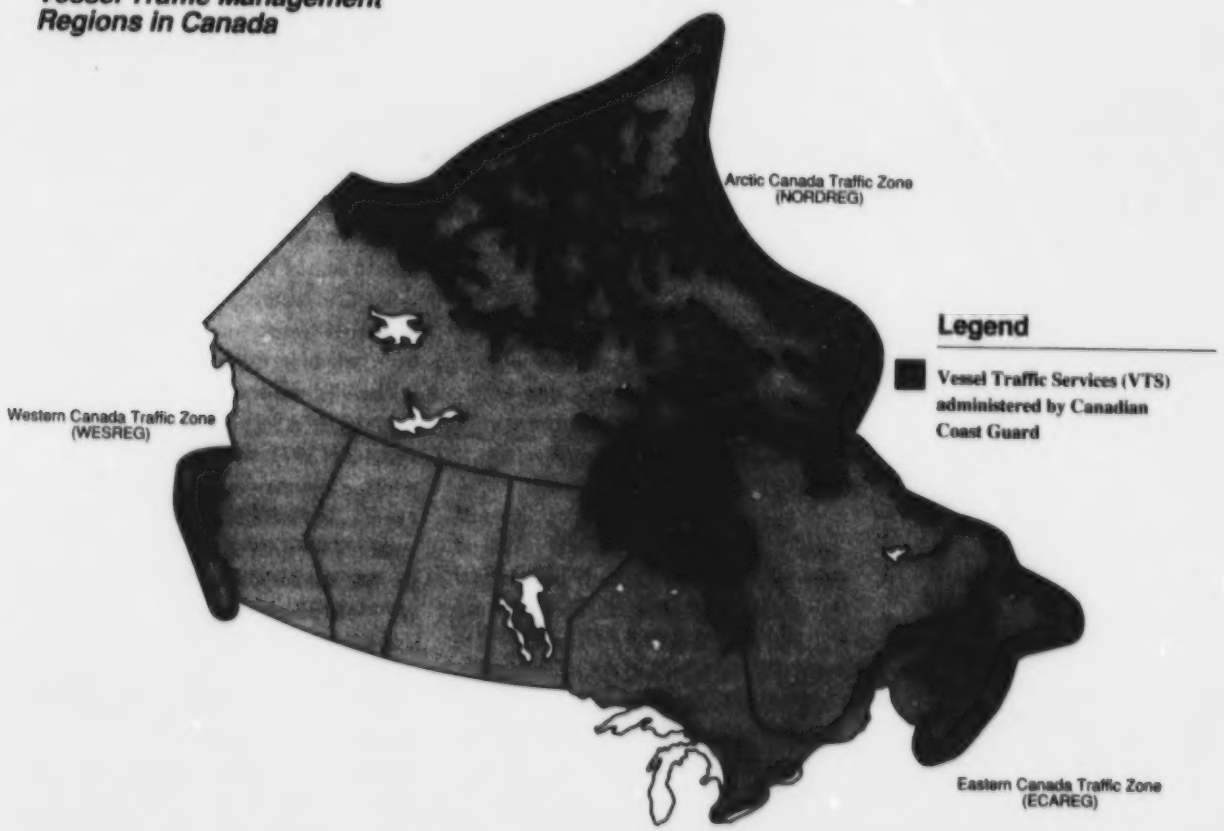
VTS systems can include various types of service, including a VHF ship-to-shore radio communications system, radar surveillance and enhancements such as automatic target-tracking and closest-point-of-approach calculations. Because VTS systems are expensive in terms of capital and maintenance costs, they are only provided in areas of particularly high risk.

The Coast Guard has suggested that VHF radio direction-finding equipment, located at Coast Guard radio stations, would materially assist in tracking and

identifying vessels. Given the importance of traffic monitoring functions, we concur that all Coast Guard radio stations should have this equipment.

In 1984, the Coast Guard conducted a national study of VTS systems to assess the adequacy of the services and an update of the study was completed in early 1988. Both studies used risk assessment analysis to calculate the relative cost and benefits of providing various levels of service in each area. They focused on economic losses related to vessels, cargoes and harbour facilities such as wharves, bridges and water intakes. Recommendations were subsequently made concerning levels of instrumentation and staffing at each VTS centre. The methodology used in the studies is a state-of-the-art approach for assessing the adequacy of VTS systems. The United States is currently taking advantage of it to review its own systems and, at the operational level, Hong Kong is using it as a model for a new system.

Vessel Traffic Management Regions in Canada


Arctic Canada Traffic Zone (NORDREG)
Western Canada Traffic Zone (WESREG)
Legend
Vessel Traffic Services (VTS) administered by Canadian Coast Guard
Eastern Canada Traffic Zone (ECAREG)

"An efficient pilot service is the most effective means of achieving safety of navigation and the safe and speedy movement of ships."

Captain Robert Stevenson, Corporation of Professional Great Lakes Pilots

The 1988 update study documents a number of cases where VTS systems need to be improved to provide adequate support for management of shipping routes used by tankers (see Table A). However, the recommendations made have not been implemented due to a lack of funding.

The government's current internal review has identified additional concerns. For example, the National VTS Study did not examine ECAREG, the east coast vessel traffic system. According to the Coast Guard, the ECAREG system "may not meet the need to promote the safe movement of pollution cargo outside the high-level VTS zone." The internal review also suggested examining the alternatives to establishing a single VTS for all east coast waters and expressed concern that vessels coming from the high seas are not required to participate in ECAREG when coming to St. John's, Port aux Basques or Placentia Bay, Newfoundland.

Recommendation 3-9

In order to remedy major deficiencies in Canada's VTS system, the Canadian Coast Guard immediately implement all recommendations outstanding from the 1988 VTS update study.

In winter, when poor visibility conditions exist, it may be necessary to restrict night navigation or completely stop all traffic in certain zones. This is particularly so on the St. Lawrence River upstream from Quebec City and the Traverse Nord, when visibility makes it impossible to see spar buoys or leading lights in winter winds. *Of particular concern to us is the fact that at present, VTS centres can only ask for voluntary closures of waterways; they cannot order closures.* We believe that the Coast Guard should have the authority to order all vessel traffic to stop when navigation conditions are unusually hazardous.

Recommendation 3-10

In order to ensure that vessel traffic regulators have sufficient authority to deal with emergencies or hazardous conditions, amendments be made to the Canada Shipping Act *empowering regulators to establish temporary navigation restrictions or closures because of hazardous traffic, weather or ice conditions.*

Pilotage

Pilotage has been important historically, and it will remain so even with the advent of new navigational technologies. Based on local and specialized knowledge of navigation in confined waters, pilots navigate vessels to and from major ports in Canada. Their in-depth knowledge of navigational hazards and experience in coastal waters is particularly valuable in ensuring the safe passage of foreign vessels whose crews may have little or no experience navigating in Canadian waters.

Pilotage is regulated under the *Pilotage Act* of 1971, which established four pilotage regions — Atlantic, Laurentian, Great Lakes and Pacific — and a pilotage authority for each one. According to the Act, the purpose of the authorities is " . . . to establish, operate, maintain and administer, in the interest of safety, an efficient pilotage service . . . " They may also make regulations which include the establishing of compulsory pilotage areas within their region. The Act requires that a ship in a compulsory pilotage area be under the conduct of a licensed pilot or the holder of a pilotage certificate. This means that the helm,

Table A
1988 VTS Update Study Recommendations

Tofino	• maintain existing VHF and radar on Mt. Ozzard
Prince Rupert	• maintain existing VHF • provide new radar system on Mt. Hayes (overlooking Prince Rupert harbour and approaches)
Vancouver	• maintain existing VHF, five radars and video camera • provide new radar at Second Narrows (with replacement of Helmken, Newton and Park radar equipment with less expensive equipment)
Sarnia	• maintain existing VHF • provide three new radars (at entrances of Detroit and St. Clair rivers and south of the Blue Water Bridge)
Bay of Fundy	• maintain existing VHF • upgrade existing radars at Tiverton and Red Head • provide new radar in St. John harbour
Port aux Basques	• maintain existing VHF • upgrade existing harbour radar
Placentia Bay	• maintain existing VHF and two radars with target analysis

engine and other orders required to manoeuvre the vessel must be given by the pilot or the certificate holder unless the appropriate pilotage authority grants a waiver exempting the ship from compulsory pilotage.

Pilots are not members of the ship's crew; they board the vessel simply to render pilotage services. On the other hand, pilotage certificates may be issued by an authority to a person who is a regular member of the complement of a ship and a citizen or permanent resident of Canada. However, the Act stipulates that " . . . no pilotage certificate shall be issued to an applicant therefore unless the authority is satisfied that the applicant has a degree of skill and local knowledge of the waters of the compulsory pilotage area equivalent to that required of an applicant for a licence for that compulsory pilotage area." This requirement, as well as those contained in the regulations made pursuant to the Act, provide for a high standard of competence for pilots and holders of pilotage certificates, in the interest of safety. It is our view that only pilotage authorities, and no other branch

of government, should grant alternative pilotage certificates or waive vessels from compulsory pilotage.

Apart from the legislative requirements, it is an obvious safety factor to have licensed pilots or holders of certificates issued by a pilotage authority on board tankers. Since pilotage is a regional concern, we make our specific recommendations on this subject in Chapter 6, *Regional issues*.

Operational spills and discharges

Operational spills can occur during oil or chemical cargo transfer operations, in the case of tankers, or when fueling any vessel. Negligence is the most frequent cause of these spills. On the other hand, discharges in sufficient quantity to create a visible oil spill are intentional and illegal. They occur when ships dump contaminated bilge, ballast or oily water from tank washings in amounts or concentrations in excess of that permitted by Canadian or international regulations.

We were surprised and distressed by how often operational spills occur.

During our tenure as members of the Public Review Panel on Tanker Safety and Marine Spills Response Capability, several incidents were reported to Canadian authorities. For a time it seemed as though our presence in a given region either coincided with, or foreshadowed, the occurrence of yet another incident, and even as we prepared this report, we were receiving news of others:

- On June 18, 1989, as we prepared for the public hearings, the Captain of the *M.T. Camargue* reported that a "few gallons" of oil had been spilled during bunkering operations at the Irving Oil refinery in Saint John, New Brunswick. Two days later, Coast Guard officials reassessed this operational accident and estimated that, in fact, 80 tonnes of oil had been spilled, posing potential risk to the lobster fishery then underway and to the area's $58 million aquaculture industry.
- In late August 1989, several participants at the Newfoundland hearings expressed alarm over the number of heavily oiled seabirds washing up with increasing regularity along the Avalon Peninsula. Just a few months later, in January of this year, experts estimated that over a two-week period some 18 000 seabirds died along Newfoundland's shores, victims of so-called "mystery spills".
- Two days prior to the session in Montreal, a Brazilian cargo vessel spilled 15 tonnes of bunker fuel into Montreal harbour. During his testimony, the harbour master outlined standard operating procedures for cleaning up such incidents: do nothing until it is clear who will reimburse clean-up expenses which might be incurred.
- Just as we were beginning the final round of hearings on the west coast, a 40-kilometre oil slick of unknown origin was reported off Sooke, British Columbia, resulting in damage to the beaches and wildlife in the ecologically sensitive waters off the southern tip of Vancouver Island.
- Shortly after we had been informed of the vulnerability of northern marine life to spills of any sort, a Canadian vessel en route to Skagway from Vancouver leaked some 218 tonnes of gasoline into the waters off Juneau, Alaska. The cause of the incident was human error.

"The potential for operational spills, however, is perhaps more likely in the North than in the South because we de operate, as you've also heard, almost on the margin sometimes, in order to get the necessary fuel delivered to the people."

Captain Ian Marr,
Canadian Coast Guard Northern

While major and catastrophic events, such as the *Nestucca* and *Exxon Valdez* spills, capture headlines and galvanize public opinion, incidents such as those described above are routinely occurring with alarming frequency in and around our coastal waters. We are convinced that few Canadians are fully aware of how much unnecessary and avoidable damage is being inflicted daily on our valuable marine environment. ***It is sobering to realize that negligent or intentional actions are the cause of almost twice as much pollution as are tanker accidents. Clearly this must stop.***

We heard extensive evidence that the loading and unloading of tankers and tank barges are two of the most hazardous operations in the transportation of oil and chemicals. This is especially true in the Arctic, where few loading docks exist. One frequent cause of such spills is the failure of flexible hoses and hose couplings at the loading dock. Current standards for these hoses and couplings must be enhanced.

Once a spill occurs at the dock site, much time is lost responding as booms are brought in and deployed to contain the spill. In the case of a small spill, much of the oil or chemicals will escape into the environment. Because of the special risks of spills at dockside loading facilities, it would be appropriate to deploy booms prior to loading, where their use would be safe and effective.

UMA Engineering Limited, in a report for the Canadian Petroleum Products Institute, advised that some spills go undetected for periods of time simply because no one is posted on watch during loading operations. As a result, a relatively minor spill can become major. This situation must be remedied immediately at all terminals.

Recommendation 3-11

In order to reduce the risk of operational spills during terminal operations, the Canadian Coast Guard establish stricter regulations governing loading operations and requiring, among other things, that:

- *flexible hoses and hose couplings be designed to a higher standard and inspected frequently;*
- *as a precaution against spills, booms be deployed during all loading operations, except where booms are demonstrably unsafe or ineffective;*
- *watch requirements be strengthened during loading and discharging operations to ensure the early detection of spills.*

Canada has a good reputation in the field of environmental management, yet when it comes to enforcing many of its regulations on shipping pollution, it is more talk than action. There is very little surveillance of marine polluters; most spills go unreported, many are not cleaned up, and offenders are rarely prosecuted. Prosecution is hampered by lack of evidence, which results from a lack of any real effort at spill surveillance and reporting. This lack of surveillance encourages careless or deliberate dumping of oil and oily wastes. Ships are able to flout both international conventions and Canadian legislation while dumping toxic pollutants into our waters at will. The current situation is clearly unacceptable.

At the hearings, we were told by many people that existing regulations must be rigorously enforced. Canada must develop a reputation for strictness and thoroughness in prosecuting polluters. To merit this reputation, its watchdogs must have teeth and must bite.

Polluters must be made to understand that Canada will not tolerate any spillage or discharge of oil in its waters. If any spill is detected, someone will pay, and pay dearly. If regulations are strictly enforced, shipping interests will be encouraged to exercise diligence and care in all their operations.

A significant number of spills could be avoided through better detection and stricter enforcement of pollution regulations. Spills can be detected through surveillance operations and reporting systems. Enforcement involves investigation and prosecution of polluters. When spills do occur, it is necessary to assess their effects and make them known. To do this, reliable information must be collected, analyzed and reported to government and the public. Improving public awareness and encouraging Canadians to report spills are essential to the prevention effort.

Surveillance

Surveillance is the starting point for any marine pollution regulation enforcement program. Regular surveillance is essential for detecting and convicting polluters who discharge contaminated bilge and tank washings, and for deterring potential polluters. Unfortunately, Canada is virtually blind to marine pollution.

Although the Coast Guard is responsible for marine spills surveillance, it has no modern surveillance capability. It was painfully obvious to us that surveillance is not a serious priority for the Coast Guard. Routine aerial surveillance to detect spills is undertaken only in the Great Lakes under the terms of the Great Lakes Water Quality Agreement, a bilateral agreement between Canada and the United States.

Outside the Great Lakes, there are no organized surveillance programs, even though the Coast Guard acknowledges that ships routinely pump bilge water and residues from tank cleaning operations into our waters despite Canadian regulations forbidding them to do so. Our coastlines are exposed to this pollution with every incoming tide.

Canada's laissez-faire attitude towards aerial surveillance of marine pollution stands in sharp contrast to that of many other countries. At least 20 nations maintain dedicated planes for marine spills surveillance, although no other country has coastlines and inland waters as extensive as Canada's. The current dearth of surveillance in Canada is inexcusable in light of the high frequency of small and deliberate spills that occur in our waters and the damage they cause. The chronic oiling of seabirds in southeastern Newfoundland, for example, is a serious problem that is probably a consequence of bilge pumping by vessels secure in the knowledge that their actions will go undetected. More rigorous surveillance may well end this slaughter.

The value of surveillance is clearly emphasized by the results of a January 1990 Coast Guard initiative (discussed in the Newfoundland and Labrador section of Chapter 6). Using its surveillance plane from the Great Lakes region, the Coast Guard conducted surveillance operations on the east coast over a few days. In that short period, three vessels were observed discharging oil and one charge was laid. This proves that vessels travelling through Canadian territorial waters can take advantage of a complete

lack of surveillance to discharge oily wastes. It also shows that Canada could do something about it if it had the will.

The surveillance operation on the Great Lakes has at its disposal one ancient DC-3 aircraft for reconnaissance and evidence gathering. The aircraft has serious limitations for these purposes and is not equipped with up-to-date surveillance equipment. To be effective, Canada's surveillance program must have the mandate, resources and equipment to deter polluters. The amount and type of equipment should be determined as part of a coordinated enforcement strategy, which should optimize the use of state-of-the-art surveillance technology. The surveillance program should first focus on areas where pollution problems from unidentified ship sources are most serious and then be expanded to undertake operations over all Canadian waters. The need for surveillance is not limited to tankers; there are numerous other cargo vessels, fishing boats and pleasure craft which also discharge bilge wastes.

Recommendation 3-12

In order to deter polluters, the Canadian Coast Guard carry out a continuous, coordinated and intensive aerial surveillance program over all Canadian waters. This will require the deployment of three dedicated surveillance aircraft (east coast, west coast, Great Lakes-St. Lawrence) equipped with the latest spill-detection and evidence-gathering technology.

Reporting

Several people at the hearings decried the lack of adequate procedures for reporting marine spills. They said they did not know to whom spills should be reported and often had to make several calls before finding the correct office. In practice, spill reports may be directed to the Canadian Coast Guard, to special reporting lines operated by Environment Canada, to provincial environment ministries or to municipalities. However, telephone numbers are difficult to identify in phone books and it is not clear which official within an agency should be contacted. There is a need for better distribution of information on how to report spills; spill reporting telephone numbers should be listed with other emergency numbers, such as police, fire and ambulance.

Each province has its own spill reporting system. Ontario's system was set up under the province's environmental legislation and is likely the most comprehensive in Canada. The legislation includes substantial penalties for failing to report spills. Needless to say, since this system was established, the number of spills reported has increased dramatically. Input to the system comes from a special hotline at the Spill Action Centre operated by the Ministry of the Environment. Ontario's experience indicates that spill reports will be more forthcoming if well-publicized hotlines are established together with penalties for not reporting.

Canadians who observe spills often report them voluntarily; however, an undetermined number of oil and chemical spills are never reported and there are significant numbers of "mystery" spills, where the identity of the polluter is unknown. It is worth noting that under the

"The image of an oiled bird staggering ashore has become, I think, probably a symbol of marine pollution in this day and age."

Dick Brown,
Canadian Wildlife Service
(Bedford Institute)

Oil Pollution Prevention Regulations, masters of ships that have discharged or spilled pollutants are required to report this discharge. If found guilty of not doing so, they may be fined up to $250,000.

Polluters have much to gain by not reporting a spill if they may be sued for the costs of clean-up. The penalties for failing to report spills are meant to counterbalance the natural impulse to not report spills, and we believe they will — if supported by surveillance and vigorous enforcement.

Recommendation 3-13

In order to involve Canadian citizens in the reporting of oil spills, Environment Canada, in cooperation with the provinces, Emergency Preparedness Canada and the Canadian Coast Guard, must:

- *disseminate information on the effects of marine spills and spill reporting procedures;*
- *ensure that 24-hour spill reporting hotlines are established and well publicized;*
- *establish a system whereby people who file reports leading to the conviction of a polluter may be rewarded (described in Chapter 5).*

"In the Great Lakes Basin, there are 22 spill reporting systems, four of which are in Canada."

Professor Donald MacKay, University of Toronto

Enforcement

Present Canadian Coast Guard investigation and prosecution activities are not tough enough to get the attention of polluters. Polluters must be persuaded that the law will be strictly enforced. We believe the Coast Guard is too timid in its prosecutions and must develop an aggressive policy for prosecuting polluters. The number of charges laid against polluters must be significantly increased and attention should be given to spills regardless of size.

The data presented to us suggest that only a small percentage of spill reports lead to prosecutions against alleged polluters. The Canadian Coast Guard Ship Safety Branch advised that prosecutions are launched under the *Canada Shipping Act* whenever there is sufficient evidence to lay charges. However, successful prosecution requires sound evidence. In pollution cases generally, a *prima facie* case can be established by identifying the polluting ship and proving that a pollutant in the water matches the pollutant carried on board the ship. This does not have to be an "after the fact" effort.

Potential evidence can be obtained by sampling fuels and cargoes from ships when they are docked. If a spill occurs later, a match may be made between a sample and the pollutant. This is referred to as "fingerprinting". Environment Canada experts advised us that technology now exists to build small sampling buoys which can be dropped into a slick by patrol aircraft and retrieved by ship or helicopter. *We strongly believe such equipment must be acquired immediately.*

Further to successful prosecution are the fines determined by the courts, and these can vary among regions. Fines in the Maritimes have averaged $1,822. A recent fine in Toronto was $15,000. The reluctance to prosecute may be due, in part, to the fact that past prosecutions have resulted in low fines. Between 1979 and 1988, fines across Canada averaged only $4,700 per case. Such a low penalty for a shipping operation carrying millions of dollars in cargo is hardly a disincentive to illegal bilge dumping, given the cost of diverting a vessel to use bilge reception facilities.

Maximum fines under the *Canada Shipping Act* are $250,000 per pollution incident. In Chapter 5, we recommend considerably higher fines and suggest guidelines that would permit judges to fashion sentences that reflect the degree of polluter intent and to impose fines that take the profit out of pollution.

When foreign vessels passing off our coasts are involved, pollution incidents are referred to the flag state (the country where the vessel is registered) for prosecution. Once a report is made, it is up to the flag state to lay a charge. The record here is not encouraging either. Between 1979 and 1988, 58 incidents were referred and 26 responses received. Of these, there were 13 convictions, for a total of $34,362 in fines. This is $2,643 per incident — hardly a deterrent. The Coast Guard states that it is frequently not advised by flag states of the disposition of cases referred to them. This problem must be addressed in the international forum.

The public has a need, and a right, to know which firms or individuals have been convicted for violating marine pollution laws. The government should have a policy of publishing information on convictions.

Recommendation 3-14

In order to deter deliberate or negligent marine pollution, the Canadian Coast Guard significantly improve its investigation of pollution incidents and aggressively prosecute polluters by:

- *expanding its investigative and prosecution capability through the deployment of additional personnel, as well as appropriate technology and equipment, including advanced evidence collection and analysis technology;*
- *implementing selective sampling of fuels and cargoes of vessels docking at Canadian ports for purposes of securing potential evidence for fingerprinting purposes;*
- *publishing the identity of convicted polluters;*
- *aggressively following up on cases involving foreign-flag vessels.*

Pollution Prevention Officers (PPOs) are appointed under the *Canada Shipping Act* and the *Arctic Waters Pollution Prevention Act*. The powers of PPOs are extensive. We believe, from our visits to the regions, and from evidence at public meetings, that there are inadequate numbers of PPOs to effectively enforce marine pollution regulations.

Until recently, the Coast Guard did not share this view. It advised us that it had enough PPOs and could appoint more on an "as required" basis. There are presently 35 Coast Guard helicopters and 57 helicopter pilots. Of these pilots, 18 are designated as PPOs, but only 3 have had even minimal instruction on detection and interrogation techniques, evidence gathering and reporting procedures. Until recently *these pilots were not actually encouraged to look for, or formally report, pollution sightings*, a factor we observed in our field visits on Coast Guard aircraft.

Apart from the Coast Guard, there are several agencies with pollution control responsibilities and operational capabilities. Consideration should be given to appointing selected personnel of these agencies as PPOs. Agencies with personnel responsible for environmental policing include the Department of Fisheries and Oceans, Environment Canada (Canadian Wildlife Service), provincial fish and wildlife ministries, and the

RCMP. There are other agencies with duties related to shipping and protection of our waters. These include the Canada Ports Corporation, which is studying the feasibility of designating the Ports Canada Police as PPOs; and the Department of National Defence, whose Canadian Rangers have roles in the Arctic, as well as along the coasts of northern British Columbia and Labrador. The idea is to designate government personnel who are already in the field with surveillance or environmental responsibilities, in order to increase the number of PPOs and gain more effective enforcement.

Recommendation 3-15

In order to expand Canada's surveillance capability, the Canadian Coast Guard:

- *appoint all Coast Guard helicopter pilots as Pollution Prevention Officers and train and direct these pilots to undertake marine pollution surveillance of shipping as part of their routine flight duties;*
- *appoint selected personnel from other government agencies as Pollution Prevention Officers.*

Public awareness

The Government of Canada has endorsed environmental protection as a major national objective. Since public awareness is key to meeting this objective, information kits should be prepared explaining how marine spills occur, how they affect the environment, and how concerned citizens can report spills. These kits should be distributed to schools, as well as to fishermen and others who are in a position to report spills.

Regular reports should be prepared to inform the public about the nature, frequency, trends and location of spills. Besides indicating the number of investigations and convictions, reports should specify the amount of the resulting fines and provide information on the spill response effort and the cost of clean-up. It would also be useful to summarize new information on spill prevention, response and training programs, and research and development activity.

Trends in environmental quality and environmental problems and concerns are identified and documented in Environment Canada's *State of the Environment* reports. These reports should also present data and trends concerning marine spills.

Recommendation 3-16

In order to increase public awareness of marine spills and pollution and their environmental effects, Environment Canada:

- *publish an annual report on marine oil and chemical spills;*
- *address marine pollution through the provision of educational packages to school boards in all coastal areas;*
- *in cooperation with the Department of Fisheries and Oceans, distribute information kits to fishermen concerning the* Oil Pollution Prevention Regulations *and encourage them to report sightings of marine spills.*

Statistical information

In our attempts to determine the frequency of spills, especially small spills, we were appalled by the lack of complete and accurate data. Even when spill reports are made, statistics seem to disappear into a bureaucratic vacuum. It

"Spill prevention programs must emphasize human factors. Federal and provincial spill prevention programs should focus not only on the physical factors, such as ship design, construction, storage and transfer of cargo, but also put particular emphasis on human factors that lead to spills."

Philip Weller,
Great Lakes United

is impossible to define with any reliability what the trends are — whether spills are increasing or decreasing. This data must be carefully gathered and analyzed so that public opinion and public policy may be properly informed. This is particularly important where drinking water supplies are vulnerable, such as in the Great Lakes and St. Lawrence regions. The public has an absolute right to know.

Statistics on oil and chemical spills provide information on where and how accidents happen. This enables operators and government to plan prevention programs to avoid these accidents. While statistical information may seem a technical issue, it drives to the very heart of the prevention problem. It is hard to imagine how government and industry intend to carry out proper prevention planning without information on the locations and operations where spills occur. It will be equally difficult for government to determine if prevention programs are working.

There are many spill reporting networks and data bases in Canada, including provincial agencies, Environment Canada, the Canadian Coast Guard and Transport Canada. The Coast Guard collects information on ship-source spills as part of its responsibilities under the *Canada Shipping Act* and the *Transportation of Dangerous Goods Act*. This information is usually shared with NATES, the National Analysis of Trends in Emergencies System.

NATES, the only national spills data base in Canada, is operated by Environment Canada. It covers (at least in theory) *all reported spills* over specific thresholds established for each chemical, including oil. Spills on land and water from all modes of transportation and stationary sources are included. NATES began operation in 1973 to serve as a means of summarizing trends and designing prevention programs. Data are tabulated and summarized every couple of years, and summary trends are published, but information from the data base is not widely distributed.

NATES has a number of deficiencies which affect its value as a marine spills data base. It is not comprehensive because participation is voluntary; there is no legal requirement compelling other agencies to share data with the system. Provinces, which have a major responsibility to collect spill data, submit non-uniform information in terms of detail. Because of this, the data base likely contains information on only a fraction of the actual spills that occur and, as a result, seriously underrepresents the real damage being caused by spills in Canada. NATES data are not useful in planning prevention programs to reduce human error because no detail on the circumstances of accidents is collected. Moreover, the lack of verification seriously affects the quality of the conclusions that can be drawn from the data.

In our opinion, NATES is not, at the present time, an adequate system for determining the number and nature of marine spills. This leaves a serious information gap when it comes to addressing spill prevention and response.

Recommendation 3-17

In order to provide a complete and accurate picture of marine spills, Environment Canada, as the agency responsible for NATES, strengthen the data base by:

- *coordinating the establishment of a comprehensive spill statistics reporting network and ensuring mandatory participation of all relevant agencies (through legislation if necessary);*
- *reviewing information requirements with other agencies and the public to ensure that NATES provides detailed and useful data for analysis by policymakers;*
- *establishing standard reporting formats to ensure comparability of the data received from different reporting agencies;*
- *auditing and verifying the quality and consistency of the data being reported to the system;*
- *ensuring that access to summary information is user friendly and that data summaries are widely distributed.*

Reception facilities

All power-driven vessels accumulate oily bilge water during normal operations. The rate at which this water accumulates and its oil content are dependent upon the age, condition and size of the vessel. Some crude oil tankers, and nearly all product and chemical tankers, must have their tanks washed between cargoes, and the tank washings must eventually be discharged.

Through the MARPOL Convention, discussed at length in Chapter 5, participating states have agreed to place percentage limits on the amount of oil and oily waste that ships may discharge. Oil is contained in bilges, contaminated ballast and residues from tank washing.

Residues from previous oil cargoes must often be removed from cargo tanks before tankers arrive at ports to load new cargoes. Although the wastes from this cleaning operation are supposed to be discharged at reception facilities, they are often simply dumped into the sea.

Tankers and other vessels must carry water for ballast when not laden. This water is discharged before the tanker is loaded with oil. In the past (and present with many tankers), ballast water was put directly in oil cargo tanks, meaning that it would be heavily contaminated with oil. Under Canadian regulations, discharge of ballast water is only allowed if the water does not contain oil. This is the so-called "zero discharge" regulation. Under MARPOL, *segregated* ballast water can be discharged without restriction. Other ballast water that may contain oil can only be discharged under monitored conditions and the discharge of oil must be within limits set out in the convention.

Even when only water is carried in ballast tanks, the water can carry alien organisms which can have a serious effect on local ecosystems. For example, the rapidly multiplying zebra mussel was likely introduced to the Great Lakes in discharges of ship ballast. It is crowding out local organisms by attaching to spawning reefs, clogging water supply intakes and cementing itself to boat hulls. Other organisms have been introduced as well, including the spiny water flea and the European river ruffe, a perchlike fish that feeds on the eggs of other fish species.

These organisms can wreak environmental havoc, including damaging fish habitat, disrupting food chains and preying on other more valuable species. Once

established, there is no known way to eradicate these species. The impact of these organisms may be more devastating than that of an oil spill.

The Coast Guard's response, in cooperation with other agencies, is to request that ships entering the St. Lawrence Seaway exchange their ballast at sea before entering the Seaway. On an experimental basis, ships may exchange their ballast in the Gulf of St. Lawrence, a practice we do not believe should be condoned. The Coast Guard will be monitoring the ballast exchange guidelines to determine if they are effective, and if not, consider regulations.

The MARPOL Convention requires signatory governments to provide reception facilities to receive wastes from ships (contaminated ballast and bilge waters) at their ports and harbours. It establishes guidelines for capacities and throughput of facilities depending on the nature of shipping in each port. These facilities should be capable of receiving all water and oily wastes from the cleaning of oil or chemical tanks, as well as oily water from cargo tanks of non-segregated ballast tankers.

To meet that requirement, Canadian oil and chemical terminals have provided reception facilities for ships. Preliminary findings from a study by Acres International Limited suggest that most major ports are able to provide the services *requested* by foreign ships. This assumes that foreign ships actually request such services. We have been told that no port in Canada has sufficient pump-out facilities to handle tankers and *we are convinced that present facilities are seriously inadequate and that the Government must act to ensure that adequate facilities are established immediately.*

The lack of suitable reception facilities may lead to illegal discharges, and the Coast Guard confirms that surreptitious dumping of oil-contaminated water does occur. The full extent of this problem is not known, but it is probably exacerbated by the shortage, or lack, of reception facilities in some ports. Reception facilities, and appropriate regulatory controls to require their use, are necessary to provide the means for vessels to comply with Canada's zero discharge regime.

Some terminals charge vessels a fee per barrel for discharge of contaminated ballast. This provides operators with a good reason for discharging ballast and tank washings at sea before arriving at the terminal. According to the Coast Guard, ships evade reception facilities to avoid user charges. It has been suggested that reception facility charges be integrated with other port charges so that fees do not continue to be disincentives.

Recommendation 3-18

In order to minimize the illegal dumping of oily bilge and other wastes, regulations be introduced which:

- *require terminals to provide reception facilities adequate to receive all ballast, slop and bilge water from all tankers docking there;*
- *require terminals to receive oil-contaminated water from tankers before allowing them to depart;*
- *require tankers to discharge oil-contaminated water at approved reception facilities before entering the St. Lawrence Seaway;*

"Incidents at docks are the major contributor to most marine oil spills, although they are generally of small quantity."

George Brereton,
Ontario Petroleum Association and PIMEC

- *require that all ballast and bilge valves on Great Lakes tankers be sealed and that these seals be broken only in emergency situations;*
- *ensure the availability of facilities capable of handling chemical wastes in an environmentally acceptable manner;*
- *require that inspections be conducted to ensure that reception facilities are being used;*
- *ensure that reception facility user costs are integrated with other port charges.*

Chemical spills

"The capability of a shipowner, especially of an itinerant foreign tanker owner, to mount an adequate response to other than very small . . . operational spills is limited."

Captain Keith Jones, Gulf Canada Resources Limited

While many of the recommendations we make in this chapter apply equally to oil and chemical spills, chemical spills are markedly different from oil spills. They may *seem* less serious than oil spills by their often invisible nature: many chemicals, some of which may be toxic, either sink, float or dissolve in the marine environment. However, according to the U.S. Coast Guard, chemical spills often cost ten times as much as oil spills, and take five times as long to successfully clean up.

Various companies offer training programs for employees dealing with chemicals. Guidelines have been set in the *Transportation of Dangerous Goods Act* which specify aspects of dangerous goods handling for which employees must receive training. Employees are considered "qualified" if the employer is satisfied that they are adequately trained. The employer then issues a Certificate of Training indicating when, and in what aspects, the employee was trained. The legislation does *not* stipulate the components of the training programs, nor does it set a minimum standard for dangerous goods training. Section 9 of the Act permits workers who are not trained in the handling of dangerous goods to do the work if they are supervised by someone who is trained.

The Vancouver Area Transport of Dangerous Goods Study recommended that Transport Canada establish training standards specifying the objectives of dangerous goods courses and, based on these objectives, develop model examinations to ensure consistent training and certification. The study also recommended that specialized response training courses be developed and that regulations be amended to require that a trained supervisor be present at all times when untrained personnel are working.

The Environmental Emergencies Technology Division of Environment Canada has issued its own policy on minimum training standards, while the Coast Guard has developed a plan for a training and certification program.

Recommendation 3-19

To reduce the risk and impact of chemical spills, the Canadian Coast Guard amend certification regulations to introduce or strengthen requirements for training and certification of all tanker and terminal personnel involved in the transportation and handling of chemical cargoes.

By making chemical tankers safer, chemical spill prevention can be improved. Chemical tankers are much smaller than most oil tankers and most of them are compartmentalized to allow the transport of a variety of chemicals on each voyage. International standards[4] require these tankers to be designed and built with double hulls, coffer dams for isolating cargoes and firefighting systems to ensure that cargoes are safely and properly segregated from each other.

Although Canada has not yet acceded to MARPOL, we were advised that the majority of chemical tankers in Canada meet international standards. As MARPOL is implemented, inspections should focus on the compliance of all vessels with this convention.

Similar international standards exist for the design and construction of chemical barges. According to The Canadian Chemical Producers' Association, the United States has comprehensive standards. The Association recommends that Canada upgrade to at least U.S. standards and, if there are still deficiencies, that the two countries discuss a common set of upgraded standards. The Association also identified a need for Canada to review, standardize and upgrade dockside chemical tanker requirements for loading and offloading at both public and private dock facilities.

Recommendation 3-20

In order to provide for safer operation of chemical tank barges, the Canadian Coast Guard, in consultation with the U.S. Coast Guard, should introduce stringent standards for design, equipment and operation, with:

- *the adoption of the more rigorous provisions of Canadian or U.S. regulations as an interim measure;*
- *operational and inspection procedures for chemical barge loading and unloading.*

1. Lloyd's Register, 1988.
2. S1465 and HR 1465 must be reconciled in "Conference Committee". Legislation is expected to be passed by early autumn of this year.
3. The National Oil Pollution Compensation Fund.
4. Annex 2 of MARPOL.

Chapter four

Response

Introduction

To be at all effective, a spill response effort must be coordinated, concentrated and immediate. Using these three criteria to judge Canada's response capability and organization, it becomes clear that Canada is *not* prepared to respond to marine spills. In the course of our review, we were told by knowledgeable people that Canada's present marine spill response capability and organization are inadequate, and we have received extensive evidence supporting this.

While we were pleased to hear about recent initiatives to improve Canada's response capability from company officials and government representatives, we were distressed to learn how limited that capability actually is — a sentiment strongly shared by the Canadian public.

Immediacy of response to marine spills in Canada is hindered by the fact that responsibilities are not clearly assigned, contingency plans are inadequate, logistical support is weak, and clean-up equipment is limited and often inappropriate. These shortcomings have sobering implications for the future of our marine environment.

There were significant spills in several areas of Canada during the course of our review and our own observations confirm what many people have told us: spills occur quite frequently. Catastrophic spills will also continue to occur. These are by far the most difficult to cope with because they result in a large concentration of oil or chemicals and at the moment we have neither the equipment nor the experienced clean-up personnel required. We remain convinced that prevention should be the first line of defence against marine pollution, but Canada must prepare to respond to spills of all sizes.

Current response capability

Government and industry response capability varies across Canada. The Canadian Coast Guard maintains 52 stockpiles of spill response equipment at various locations with a replacement value of approximately $35 million. Many people who spoke to us during our review expressed concern about the quantity and location of this equipment. Clearly, it should be located where the risk of spills is highest and where countermeasures are most likely to be effective.

Private firms and industry cooperatives hold a smaller amount of equipment to deal with spills that may occur at or near their terminal facilities. However, the private sector's response capability is uneven, both in terms of contingency plans and the capacity to implement them. In an independent review of 25 facilities and operators across Canada, UMA Engineering Limited found that about 60 per cent of the facilities evaluated could not totally contain and fully recover spills in the 15- to 30-tonne range — the range used in the prudent worst-case scenario for the sites.

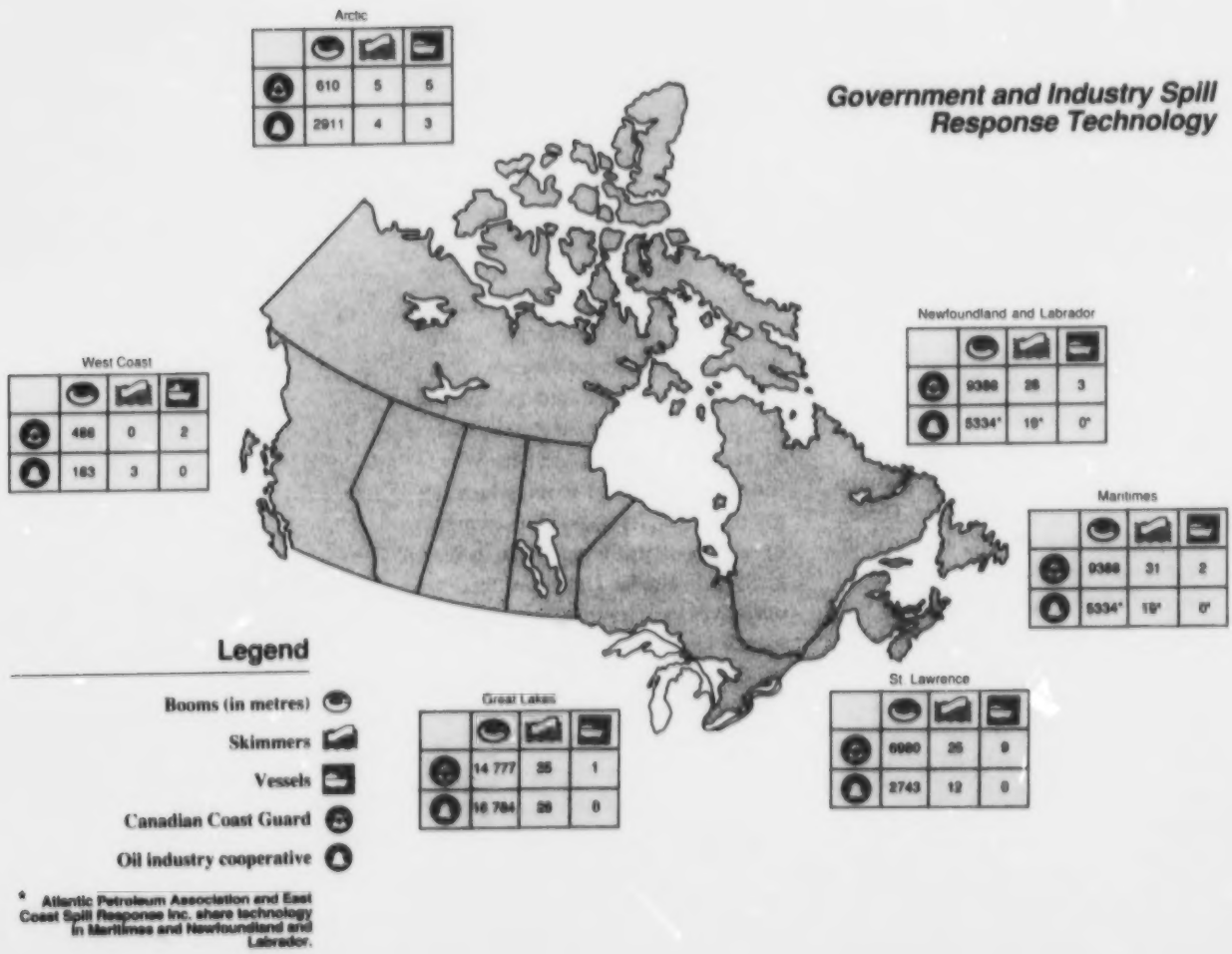
Industry has organized and operates two spill cooperatives, Burrard Clean in Vancouver harbour and Blue Water Clean on the St. Clair River, which supply equipment for responding to spills that are too large for individual industrial facilities to handle. Until now, these cooperatives have responded only to spills in their immediate vicinity. However, the Canadian Petroleum Products Institute (CPPI) is endeavouring to change that. In November 1989, it introduced an initiative aimed at strengthening the cooperatives by significantly enlarging their areas of service. The Institute also plans

"At the moment, what we do is we pull together the nearest experts or those nearest to the incident with some experience, but we are not fully exploiting the total accumulated knowledge."

Dr. John Vandermeulen, Bedford Institute of Oceanography

to establish two new cooperatives (one in the Quebec corridor of the St. Lawrence and another in Halifax) and to commit substantial member resources to cooperatives and response equipment in the next five years (roughly $50 million) over and above what individual companies may spend. Spill cooperatives also exist in the Beaufort and in Newfoundland, but they serve primarily, if not exclusively, the offshore hydrocarbon sector, rather than the shipping industry.

It is difficult and dangerous for response teams to respond to a chemical spill emergency unless they have in-depth information on the types and locations of chemicals on board. This information is much more readily available for bulk chemical carriers than for container ships. Product data sheets on every chemical in a vessel's cargo must be readily available and a stowage plan must be prepared for each voyage indicating the quantity, location and packing specifications of each chemical. Moreover, the Canadian Coast Guard should also have quick access to the plans (through electronic or other means). We have been told by the Coast Guard and others that this is a time-consuming and difficult task, but the Coast Guard must have adequate information to ensure that response teams and the environment are not put at risk.



As previously stated, Canada's ability to respond to marine spills of hazardous materials is, at best, limited. The Canadian Chemical Producers' Association (CCPA) has 11 teams participating in the Transportation Emergency Assistance Program, but they are oriented towards rail and road incidents. On the other hand, Environment Canada's River Road Emergency Technology Centre has prototype equipment for removing toxic chemicals from water, but it is not yet suitable for operational spills. Moreover, the Centre does not have an operational role, and although over half of its spills budget has been directed to chemical spills for the past six years, that budget is small and the Centre remains the only agency in Canada doing applied research on the subject. The Coast Guard does have an operational role, but it holds only personal protective equipment and has few trained personnel or personnel with sufficient knowledge of chemicals to be able to make informed decisions at a spill site.

Overall, the chemical industry's present effort is woefully insufficient, given the fact that it is a $10 billion industry. With the exception of the Transportation Emergency Assistance Program mentioned above, where a major effort has been mounted, company-level spill response initiatives are at best disorganized and at worst non-existent.

There are some 200 Canadian chemical manufacturers who are not members of the CCPA and who, apparently, have no transportation-related spill response capability. This is particularly troubling since, unlike oil spills, marine spills of toxic chemicals can have an immediate deleterious effect on human health as well as on the environment. The CCPA acknowledged this situation in the brief it submitted at the hearings, but indicated hope for improvement, stating:

"... we acknowledge that we have only a limited ability to respond to marine incidents. Through a cooperative effort between government agencies, shippers — including CCPA members — and shipowners, we believe that an effective and efficient marine emergency response capability is possible."

Recommendation 4-1

A national response team specializing in chemical spills be formed as an immediate priority and comprise representatives from the Coast Guard, Environment Canada and industry. This team must have major policy development capacity, given the embryonic nature of Canada's chemical spill response framework.

The national chemical spill response team be required to:

- *provide advice on the development of a national chemical spill response framework;*
- *assist in the development, approval and testing of industrial, Coast Guard and port authority chemical spill contingency plans;*
- *keep up to date on developments in marine chemical spill response techniques and technology;*
- *assist regional response organizations in the event of a chemical spill and support regional advice to the On-scene Commander, where required;*
- *assist in training Coast Guard and industry regional chemical response components.*

On the legislative side, it is necessary to ensure consistency between the *Canada Shipping Act* and the *Transportation of Dangerous Goods Act* on the issue of financial responsibility of shippers. Shipowners/operators should be required to prove their financial ability to cover costs if the vessel/cargo are involved in an incident. Voluntary compliance should be sought until legislation is implemented. This requirement, as well as the need for chemical industry participation in a fund similar to the Ship-source Oil Pollution Fund, are addressed in Chapter 5 of this report.

At the international level, we note that initiatives are pending with regard to an international chemical spill liability fund, but we assume that the evolution of such initiatives will necessarily be protracted. For this reason, we encourage the early consideration of a Canadian fund similar to the Ship-source Oil Pollution Fund that would cover both liability and the acquisition of tiered national response capacity with respect to marine chemical spills. We recognize that it will be difficult to establish the basis of such a fund, given the nature of chemical transportation, the diverse nature of chemicals themselves and the realities of product identification.

The response model

Canada needs an unambiguous national model that defines the roles of all participants in spill response. It is essential that this model be clearly delineated and broadly communicated to all parties involved. The oil industry has suggested a three-tiered approach and the federal internal review espoused regional capacity of 10 000 tonnes. We are therefore proposing a model that combines both a three-tiered approach and regional capacity of up to 10 000 tonnes. This model is described in Table A, Oil Spill Response — A Model for Authorities and Capabilities, which is detailed in the pages that follow.

Level I: facilities

The first level of response is specific to facilities (refineries, government and industry loading and off-loading facilities, ports and municipal harbours). Companies must have enough equipment immediately at hand at these facilities to effectively address smaller spills associated with their operations. Moreover, each facility's response capacity should be developed using a worst-case scenario. This is generally much less than 100 tonnes, but in some instances could be greater. In other words, required capacity must be based on the actual assessed risk. We also conclude that the contingency plans to meet this risk must be mandatory, regularly updated and formally approved and signed off by the Canadian Coast Guard against standards and practices contained in regulations.

It must be clear that the operator of the facility then manages the required response, subject to monitoring by regional Coast Guard emergency response authorities. These authorities must be able, and prepared, to enforce adherence to the response plan and to assume the responsibility of command as the On-scene Commanders. This should only occur in the event of shortcomings or delays, or until the local facility is deemed competent to assume or reassume management responsibilities, using facility or other resources, as directed by the On-scene Commander.

Level I response entails the intensive participation of the Canadian Coast Guard and associated agencies. They must provide advice and assess, test and

Table A
Oil Spill Response — A Model for Authorities and Capabilities

Organization Responding	Management and Control	Response Capacity	Spill Locations	Equipment & Resources
Level I — Facilities				
Facility operator (may require pre-arranged local industry co-op assistance)	Facility/company manages spill (Canadian Coast Guard monitors with authority to assume command if necessary)	Site-specific (usually less than 100 tonnes)	At the site of the commercial/ industrial facility	Suitable equipment and personnel on site for response to worst-case local operational scenario Contingency plans reviewed and approved by the Coast Guard
Level II — Regions				
(a) Industry area cooperative(s) within current Coast Guard regions	Industry manages spill response using Level I and Coast Guard equipment (Coast Guard monitors with authority to assume command if necessary)	Total regional capacity of 10 000 tonnes	Within present Coast Guard regions comprising one or more industry cooperative areas	Dedicated personnel and equipment appropriate for the conditions within each region
(b) Coast Guard Regional Marine Response Organization	Coast Guard takes command under certain conditions and always in the Arctic		Arctic, Northern Region	Major Coast Guard Northern Region capacity in personnel and equipment; industry co-op at Tuktoyaktuk
Level III — National				
Coast Guard	Coast Guard immediately assumes command and responsibility to deploy and support regional, industry, government and international resources	Over 10 000 tonnes or major spills (less than 10 000 tonnes) deemed to have potential catastrophic impact	Anywhere in Canada	Coast Guard access to: • industry, co-op and government equipment and personnel; • international resources as may be required

approve local contingency plans. To assume this important role, the Coast Guard will require significant dedicated resources, which are not presently available. The responsibility to monitor operations and to assume rapid direct control, in particular, will require dedicated and immediately available personnel to act as On-scene Commanders. Notwithstanding the overall responsibility of the Canadian Coast Guard, most of the investment in response capacity and its management at Level I should be in the hands of the private sector.

Level II: regional response capacity

Regional response capacity and responsibility are the Achilles' heel of current national preparedness. We are encouraged to see agreement within the internal review that regions should be able to address spills of up to 10 000 tonnes. On the basis of current risk analysis projections, we feel this is the prudent level of capacity required at the regional level — a region corresponding to the geographic areas delineated by present Coast Guard organization (Pacific, Great Lakes, St. Lawrence or Laurentian, Atlantic, Newfoundland and Northern regions).

The major issue to be decided is to what degree industry and government will be responsible for the necessary resources and their deployment. The regional response should include all the industry and government resources available for redeployment within the region. The bulk of this enhanced regional response capacity will be derived from industry.

We commend the CPPI's rapid expansion of its existing regional cooperatives and its creation of new ones in Halifax and Quebec. New initiatives have been taken by the CPPI at the expense of its members, but not all downstream refining companies are members of the Institute. Therefore, in order to ensure that the expenses are shared equally, all refining companies must be required, by regulation, to belong to the CPPI. Industry's willingness to cooperate in linking regional capacity within the Coast Guard's national response framework, including the joint development of national locator banks for equipment and skilled personnel is also to be commended.

Equally important to physical capacity is industry's management capacity for response efforts. This capacity remains largely to be developed, notwithstanding the excellence of existing cooperative management.

At Level II, the Canadian Coast Guard will ultimately be responsible for monitoring and assessing the adequacy and speed of regional response by industry. However, it must be prepared to assume immediate management of the response and to command and deploy any regional resources as may be required, particularly for major spills. At Level II, this role and the current physical capacity of Coast Guard regions will be required mainly over the next three to five years, while appropriate industry physical and management capacity are evolving. Other circumstances where the Coast Guard will have to assume command from the outset could include responses that entail the deployment of two or more cooperatives, and requirements for sea and airlifts, or offshore containment and recovery, that are beyond industry's collective capacity. Where major spills involve facilities that are not members of cooperatives, or where international boundaries are affected, the Coast Guard will have to assume command.

"An hour at the beginning of a spill is worth a month at the end, when beaches are being cleaned up and the damage has been done."

Owen Myers,
Fisheries Information Services

A special Level II regional response capacity is necessary for the Arctic. We believe that industry's collective capacity must be appropriate to the regional risks associated with commercial shipping along the Mackenzie River, in adjacent waterways and in Hudson Bay. There is now a good basis upon which to strengthen this capacity to levels approved by the Canadian Coast Guard. For the remainder of the Arctic, the Coast Guard must assume Level II regional response for the foreseeable future. We deal with the matter of Arctic depots in greater detail in Chapter 6.

Level III: national response capacity

National capacity is defined as the capacity to deal with a catastrophic spill — over 10 000 tonnes — whether offshore or on a lake or river. Spills of this magnitude and those which might have a significant impact on national resources will be beyond the response capacity of any single region. In such instances, the Canadian Coast Guard must automatically assume management of the response and apply the provisions of the national response plan related to the deployment of various regional resources and to reciprocal international capacity arrangements.

Contingency plans at this level will necessarily involve complex and intensive logistics and transportation requirements. Given the urgency associated with oil spills, and major or catastrophic spills in particular, such contingency plans, while utilizing industry and Coast Guard capacity, will necessarily require intergovernmental and international arrangements that must be worked out in detail by the Coast Guard as the lead agency.

Recommendation 4-2

With respect to a national response model, we recommend the following:

- *The oil industry's capacity to respond to spills be augmented to handle spills of up to 10 000 tonnes, as required at the regional level. Industry's response management capacity also be augmented. Both of these aspects of regional collective capacity be reviewed and approved by the Canadian Coast Guard. Since the Canadian Petroleum Products Institute will bear much of the cost of what will now be required of the oil industry, all companies engaged in the refining of oil be required, by legislation, to be members of the CPPI.*
- *To compensate for industry's limited response capacity in the Arctic, an area of particular sensitivity, the Canadian Coast Guard be assigned special responsibility for ensuring Arctic response capacity for marine spills of all sizes.*
- *The Coast Guard at all times have overall responsibility for oil spill response at all levels. It must be ready to assume response management from the outset, at the local and regional levels, and to always be in command at the national level.*
- *The Canadian Coast Guard be given the responsibility and authority to review and approve all facility-level contingency plans.*

Funding national response capacity

The larger the spill, the less likely we are going to be able to cope with it, given the current response technologies and response infrastructure. The equipment now available can be at least partially effective in cleaning up smaller spills, but only research can improve the situation with respect to large spills. Since research takes time — no matter how substantial the investment — we must position ourselves to respond as best we can today. We must develop a national response framework with sufficient capacity to mount an immediate response using the best equipment available to achieve the best results possible.

Regional capacity to respond to spills of up to 10 000 tonnes is critical to raising Canada's present response capability to the minimum acceptable level. This well exceeds the existing collective capacity in most regions and will require an investment of between $150 million and $200 million in additional equipment.

We believe that the bulk of this investment should be made and maintained by industry. The necessary funds would be collected from industry by way of the Ship-source Oil Pollution Fund (SOPF), the terms of which would have to be revised to allow capital acquisitions of preparedness equipment by both industry cooperatives and the Canadian Coast Guard. If it were necessary to purchase specialized equipment which might be required by the Coast Guard for the Arctic or for national emergencies, but which might not be cost-effective to hold at the regional level, we feel it would be appropriate to use funds raised through the SOPF levy for that purpose.

Recommendation 4-3

In order to increase regional clean-up capacity to the minimum acceptable level, $150 million to $200 million be invested over the next five years. The terms of the Ship-source Oil Pollution Fund be revised to allow capital acquisitions of preparedness equipment by both industry cooperatives and the Canadian Coast Guard.

This recommendation will make it possible for additional equipment to be ordered at once and paid for during a realistic acquisition period at a marginal cost. If the oil and chemical industries can demonstrate that they can achieve the same result in the same time frame by some less expensive route, they should be given the opportunity to do so.

Response planning and management

Much of what we want to recommend concerning the planning and management of spill response comes from what was learned from the *Nestucca* spill, which amounts to a case study in how not to react.

The *Nestucca* spill

On December 23, 1988, after breaking its towline, the tug *Ocean Service* was attempting to recover its tow, the barge *Nestucca*, when the two vessels collided off the coast of Washington State. The *Nestucca* was holed and its cargo of Bunker C began to leak into the sea. Permission to enter Grays Harbour, in Washington, was refused, so the barge was towed about 40 kilometres offshore, where temporary repairs were made.

The swath of oil it left in its wake was carried by ocean currents in a generally northerly direction, first oiling sections of the coast of Washington, then sections of the west coast of Vancouver Island. The oil came ashore at various locations, from the southern tip of the island, in the vicinity of Sooke, to the northern tip at Cape Scott. Only two or three kilometres were considered "heavily oiled", but about 150 kilometres were "moderately" or "lightly" oiled.

Volunteers and members of the Canadian Parks Service began to clean up on January 3, 1989, the day the oil first came ashore at Long Beach, in Pacific Rim National Park. On January 7 an operations centre was set up at Amphitrite Point and the Canadian Coast Guard's On-scene Commander (OSC) arrived. A full response effort was launched three days later on January 10.

The response

The first Canadian Coast Guard clean-up personnel and the On-scene Commander arrived at the site two weeks after the spill occurred largely because of inadvertently misleading reports from U.S. officials who were purportedly "closely monitoring the situation". *Whatever the reason for this delay, it was inexcusable and everyone involved — particularly the Coast Guard — agrees that it must not be allowed to occur again.*

The excellent report on the *Nestucca* clean-up prepared by the Canadian Coast Guard recounts that the U.S. Coast Guard advised its Canadian counterpart on the day of the accident that "based on current information the spill [would] not likely impact areas in northern Washington or Canada." The preliminary chronology, dated May 10, 1989, states that on December 23, 1988 the spill was reported to be moving southwest. Since the Canadian Coast Guard is familiar with both the Davidson current (which flows generally northwest along the offshore limit of the continental shelf of Washington and British Columbia) and the coastal current (which flows in much the same direction inshore over the continental shelf) it is unlikely that it was misled by this information.

According to the chronology, and presumably this information was relied upon, on December 26 the U.S. Coast Guard predicted that the slick ". . . would not reach Canadian waters before breaking up." By that time, the slick had travelled halfway up the coast of Washington. On December 31 " . . . small amounts of oil and oiled birds washed ashore at Carmanah Point Lightstation," and the U.S. Coast Guard reported that " . . . oil [had] been sighted off Cape Flattery, Washington but minimal impact [was] anticipated." Even on January 4, 1989, the day after several beaches in the Long Beach area were oiled, the U.S. National Oceanic and Atmospheric Administration advised the U.S. Coast Guard that the oil was not expected to reach Vancouver Island.

Throughout the incident, the predictions of the U.S. Coast Guard were contradicted by the known position of the spill moving up the coast of Washington. With the benefit of hindsight, it is clear these bland assurances should have been rejected. The Canadian Coast Guard should have hoped for the best but prepared for the worst.

"The most pitiful sight during the Vancouver Island spill were the scenes of volunteers slogging through oil and muck along the beach, inundated by rain and wind, with green garbage bags in hand, desperately trying to do what they could as individuals to cope with the oil spill disaster."

Geraldine McGuire,
Canadian Union of Public Employees

"After the disasters in Alaska and Vancouver, and after what happened last weekend in Montreal, we have the impression that we are dangerously lacking in training, planning and coordination as regards the actions that must be taken should the need arise."

Eva L. Côté (Alderman), City of Rimouski

Environment Canada was advised of the incident on December 23, 1988. It discussed the trajectory of the spill with the Institute of Ocean Sciences (IOS), whose staff predicted it would reach " . . . the lower west coast of Vancouver Island within 100 hours", although by then " . . . it would have dissipated to residual tar balls." A handwritten note on the Coast Guard's situation report of that date implies that it had that information. The IOS continued to track the progress of the spill at sea, as it was supposed to, but this additional information was neither requested by the Coast Guard nor volunteered by the Institute.

The report on the clean-up also records that the original estimate of the volume spilled (159 tonnes) was subsequently revised to between 635 and 875 tonnes, and that this information was given to the Canadian Coast Guard on January 3. It was not until January 18 that ". . . it was revealed by Washington's Department of Ecology that the *Nestucca* had been towed 40 kilometres out to sea." This failure to communicate such crucial information simply confirms that the necessary questions were not asked and that the initial report on the spill was not adequately followed up. Environment Canada, the Coast Guard and the Department of Fisheries and Oceans could, and should, have been asking these questions, but it was not clear which one had the primary responsibility to do so.

When marine spills occur, the overall policy in all government departments is the same: the polluter pays. In implementing this policy, it was Coast Guard practice to take samples of the oil in the water or on the beach and compare them with the oil on board suspected vessels, in order to identify the polluter. A bond or other satisfactory security would then be obtained to cover the cost of the clean-up *before any clean-up was undertaken.*

Thus, when the *Nestucca* spill occurred, the sequence of events was:

January 1 —
representatives of Sause Brothers Towing Inc. and Washington's Department of Ecology obtained samples of oil from Carmanah Point;

January 2 —
the U.S. Coast Guard advised the Canadian Coast Guard that the oil was from the *Nestucca*;

January 4 —
the Canadian Coast Guard obtained samples of oil from the Long Beach area;

January 5 —
the oil samples were confirmed to be from the *Nestucca*, a bond was posted and Sause Brothers hired a Canadian contractor to clean up;

January 6 —
the contractor hired eight labourers in Tofino and began clean-up;

January 7 —
the OSC arrived at Amphitrite Point.

Consequences of the late response

The late response did much to discredit the subsequent efforts of federal government departments to deal with the spill and especially damaged the credibility of the Coast Guard. By the time the OSC arrived and began to set up his headquarters, about 100 volunteers and officials of Pacific Rim National Park were in their fourth day of picking up dead birds and oil with rakes and shovels. They had collected over 20 tonnes of oil and oiled debris, a commendable accomplishment. The volunteers of course wondered where the Coast Guard had been. This was the first time in British Columbia that volunteers turned out in force to assist in a clean-up. Unfortunately, the Coast Guard initially regarded their participation as a nuisance and continued to see them as more of a hindrance than a help throughout the operation.

During the first couple of weeks, the public — and particularly the volunteers — became increasingly concerned about the extent of the spill and increasingly incensed at the absence of the Coast Guard as lead agency. The media, on the other hand, was on the scene at Long Beach by January 4. Several times a day television stations were broadcasting images of oiled birds and the oil on the beach, as well as reporting the frustration of the volunteers and the absence of the Coast Guard.

The situation improved briefly with the arrival of the On-scene Commander on January 7, but was later inflamed by the lack of organization and by the efforts of the Coast Guard and the contractor to convince the volunteers that the spill was not a large one. While this was technically true with respect to the quantity of oil spilled, it was far from accurate, given the extent of beach oiled and the obvious threat to wildlife and natural resources. By January 10, the RCMP reported that near-riot conditions prevailed in the village of Tofino.

Lessons learned

The *Nestucca* spill, and the resulting delayed and confused response, presented not only the Coast Guard, but also Environment Canada and the Department of Fisheries and Oceans with an opportunity to learn valuable lessons, so that in future they can respond with "the right people at the right place and the right time."

Some of those lessons include:

- *Immediate* spill response is crucial.
- The chain of command must be understood and responsibilities within, and among, the agencies involved must be clearly defined in advance to prevent confusion, duplication of effort and delay in response.
- Carefully prepared and properly tested contingency plans are required to ensure immediate response.
- Contingency planning must provide for role definition, advance training and equipping of volunteers.
- Accessible data on environmentally sensitive areas are crucial to speedy and reasoned decision making.
- Response command must be ready, waiting and equipped for deployment.
- Effective spill response requires trained and dedicated personnel.

"The faster that you can stop it here and not let it go that extra mile, you might save yourself a couple of million dollars."

Charles Bailey,
Ontario Petroleum Association

The *Nestucca* spill led, in part, to both the federal internal review and our public review of tanker safety and marine spills response capability. The lessons learned from the incident have guided our efforts throughout the public consultation process and in the development of recommendations. **We cannot stress too strongly the need for responsible government agencies to match the prevailing mood of the public:** everyone must do everything possible to prevent spills from occurring, but when accidents happen, anything less than immediate, well-equipped and well-organized response on the part of every individual involved will be rightfully regarded as unacceptable.

In the case of the *Nestucca*, even with timely application of good technology, extensive shoreline clean-up would have been required. Too many people, however, simply fumbled the ball (and to its credit the Coast Guard chastised itself in its report on the incident). This must not happen again, and it will not happen if due attention is paid to accountability, planning, organization and training, so that effective action can be taken.

Principles of response

Immediacy of response

Immediate response is crucial. Experts agree that the effectiveness of any response depends on how quickly it is carried out. For example, S.L. Ross Environmental Research Limited conducted an analysis of two types of scenarios, one for responses initiated within 12 hours and the other for those initiated within 48 hours. The results showed the following: for a 3700-tonne spill, the volume of oil recovered dropped from 37 per cent to 7.5 per cent as response time increased from 12 hours to 48 hours; for a 16 000-tonne spill, the volume fell from 22 per cent to 13 per cent. While these estimates are based on hypothetical scenarios, they illustrate the need to act quickly.

As we examined current contingency plans, we were particularly alarmed to find that the logistical capacity to deploy and support resources was often largely assumed. In a country as large as Canada, with so many inaccessible areas, such assumptions are unconscionable. Contingency plans must be as realistic as possible in terms of deployment limitations (such as national sea and airlift capacity) and the ability to create bases for response operations. Unless these key determinants are specifically addressed, no viable contingency plan exists and response will be too late to be effective.

The polluter pays

The "polluter pays" principle is widely acknowledged in Canada — especially with regard to marine spills — and is now well entrenched in our legislation, in operational practices and in the minds of the public. In accordance with this principle, the potential polluter, who poses the risk of spills in the first place, bears the cost of clean-up. Neither the consumer nor the government should be expected to bear this cost.

We strongly endorse this principle and are making recommendations to reinforce it because, in our view, it is applicable not only in the context of liability, compensation and clean-up costs, but also in that of preparedness.

Onus of first response lies with the polluter

It is also widely acknowledged in Canada that the onus of first response is on the polluter; however, when it comes to marine spills, this principle seems to be lacking in clarity and strength of application.

In many cases, the application of the "polluter pays" principle has in fact been a deterrent to immediate response. Greater emphasis must be placed on the collective responsibility of potential polluters to respond, resources must be made available to reimburse up-front response and clean-up costs pending resolution of liability, and adequate contingency funds must be provided within the Coast Guard's operating budget.

Response participants

The lead agency

Effective spill response is dependent on everyone involved understanding exactly what is expected of them and cooperating with others to respond as quickly as possible. While the efforts of a myriad of organizations and individuals are required, there can be only *one command authority* in response operations.

Parliament's intent in drafting the *Canada Shipping Act* was to give the Minister of Transport the power to intervene if necessary; however, no obligation was placed on the polluter to clean up the spill.

An effective response organization must be capable of mounting immediate spill countermeasures for all spills in Canadian waters, whether the polluter is known or not. No time should be wasted debating who should be responding. Clearly defined *legal responsibility* to initiate a response is, therefore, the single most important requirement of effective response.

It is our opinion that the assignment of federal responsibility for marine spills to the Canadian Coast Guard *as lead agency* is justified and sound. Strong arguments have been presented to us for the delegation of this role to other government departments and for the creation of a new marine spill response organization. We must conclude, however, that no other federal agency possesses the range and depth of basic marine emergency skills, experience and capacity required for effective command.

We have also come to the conclusion that the responsibilities of the Coast Guard as the lead agency must be more clearly defined and strengthened through more formal designation. Similarly, its authority and responsibility vis-à-vis industry and other agencies must be clarified to ensure the detailed cooperative spill response effort required.

Recommendation 4-4

The federal government formalize in legislation the responsibility of the Canadian Coast Guard, as the lead agency, to establish and manage Canada's marine oil and chemical spill response capacity. This formalization must reflect the joint responsibilities of industry and government for preparedness measures in language that unequivocally translates the sense of urgency and immediacy required for marine spill response. The authority of the Coast Guard to establish, as well as to command the deployment of, industry and government resources must also be made clear.

"In the area of policy and prevention, we believe a combined consultative and cooperative approach by industry and governments will provide Canadians with the overall best solutions to address the prevention of marine oil and chemical spills."

Andrew Marynowski, Shell Canada Limited

The On-scene Commander

The key figure in any spill response effort is the On-scene Commander (OSC), in effect the field commander who directs the whole operation. From what we have observed, the success of a response demands clear and absolute accountability and authority for the OSC.

While opinions differed across the country as to how the OSC should be selected, everyone agreed that only one was needed. In particular, people felt that the OSC had to be well informed and sensitive to the environmental impact of decisions taken. Mechanisms to provide such advice to the OSC do exist, in the form of Regional Environmental Emergencies Teams (REETs), and we will comment on them later. Suffice it to say here that we conclude that the nature of the REET chairman's task — to reconcile and consolidate environmental impact advice to the OSC — does not imply that he or she is the OSC's backup replacement, nor does it imply that the two roles can be embodied in a single authority.

We conclude that the OSC should be selected from the Coast Guard, the source of personnel with the extensive experience in marine operations that is the basic prerequisite for the job. At present Coast Guard OSCs are designated by virtue of their position in the agency's hierarchy (they are district or regional managers). While incumbents would normally possess the depth of operational experience and the geographic familiarity desired, we believe a much larger team of regional and national OSCs should be established and trained. This will provide greater depth and backup, so that OSCs will not be deployed for long periods without being relieved. It will also minimize disruption of regular management responsibilities. Given the range of spills to which OSCs may be required to respond, particularly in the case of chemical spills, it would appear logical for the team of OSCs to reflect different levels of operational experience and technical exposure.

Recommendation 4-5

Only experienced personnel who have been trained by the Canadian Coast Guard be designated as On-scene Commanders. A team of OSCs, reflecting an appropriate range of experience and technical exposure, in addition to the ability to exercise command in emergency situations, be established and maintained nationally.

At present, both the Coast Guard and industry employ the term *On-scene Commander*. This can lead to much confusion during response operations, when it must be absolutely clear who is accountable and in authority.

Recommendation 4-6

The term On-scene Commander and the acronym OSC be applied only to the Canadian Coast Guard appointee.

The On-scene Commander is supported by many different organizations during a spill response operation. Several of these are reviewed below because of the amount of discussion they generated at the public hearings and because there is a great need to clarify their roles.

Regional Environmental Emergency Teams

Environment Canada and the Coast Guard signed an agreement in 1975 providing for the establishment of Regional Environmental Emergency Teams (REETs) to offer single-source advice

to the OSC on environmental matters and priorities. REET members include representatives of federal and provincial agencies, municipalities, native groups and industrial organizations with a mandate for spill response. Prior to a spill, the teams participate in contingency planning and exchange information on equipment and response strategies. During the actual response, they identify sensitive areas and recommend clean-up priorities and methods.

We are satisfied that REETs are appropriately designed; their basic structure is sound and their contribution valuable. However, two aspects of the teams require clarification. First, since, in our opinion, Environment Canada is the department with the strongest mandate for environmental protection, REET chairman should always be members of that department. Secondly, it should be understood that the advice the chairmen provide to the OSC must be followed, unless there are valid reasons for rejecting it.

Recommendation 4-7

Regional Environmental Emergency Teams be established, or expanded, for all regions to ensure broad representation appropriate to the range of potential marine spills. REET chairmen be formally designated from Environment Canada and held accountable for the provision of consolidated environmental advice to the On-scene Commander. In addition, a team of REET chairmen, reflecting the appropriate range of experience, be established in advance and maintained.

Environment and Fisheries

In some cases, Environment Canada, with Coast Guard agreement, is the lead agency for spill response. For example, in the Atlantic region, the department is the lead agency for marine spills from sources other than ships or drilling rigs. In the Great Lakes, it is the lead agency under the Great Lakes Water Quality Agreement, but it relies on the Coast Guard to implement responses to ship-source pollution. We view this as a matter of prudent delegation, as long as such arrangements reflect the most appropriate expertise and do not diminish the Coast Guard's responsibility as overall lead agency.

Several branches of Environment Canada provide specific support. For example, the Conservation and Protection Service provides the REET, remote sensing, and advice on sensitive areas and clean-up methods. The Atmospheric Environment Service produces site-specific weather forecasts and, in conjunction with Conservation and Protection, spill-movement projections based on trajectory modelling. The Canadian Wildlife Service provides expertise in the area of wildlife protection and the treatment of injured wildlife. Finally, Parks Canada supplies information on marine and coastal parks and national historic sites and their sensitivities.

For its part, the Department of Fisheries and Oceans contributes extensive expertise regarding the protection of fish and fish habitat, and associated economic interests. The Department also provides hydrographic mapping services and spill-trajectory forecasting, and advises the OSC through the REET mechanism.

National Defence

Throughout the country, people stated that they expected a great deal from the Canadian Armed Forces, both in the area of spill response and spill prevention. Expectations were particularly high with respect to the military's role in response to major or catastrophic oil and chemical spills. Some people went as far as proposing that the military be placed in charge of response operations, as is the case in France.

The Department of National Defence (DND) participated in the federal internal review and also appeared before us at the public hearings. We commend the clarity with which current departmental policy was placed on the public record and the frankness with which departmental officers discussed the limitations of available resources and the likely conditions under which they could be called upon.

Departmental policy is that " . . . in a major environmental catastrophe, so serious as to be declared a national emergency, the Department of National Defence will be ready to provide resources to the limit possible, consistent with the pursuit of its primary mission." In situations other than national emergencies, DND will respond to requests for assistance provided certain criteria are met. However, such assistance is not currently funded and would be provided on a cost-recovery basis.

The Department clearly indicated that, contrary to public expectations, its capacity in the area of spill response is extremely limited. It does not possess spill response equipment, but it can provide support in the following areas:

- personnel;
- heavy and light airlift;
- air traffic control services;
- communications;
- logistical support (transport, medical, field camps);
- marine lift and marine logistics;
- engineering and other technical support;
- Arctic and remote area deployment of personnel and technical assistance.

Notwithstanding the above assets, we recognize the current limitations on DND participation and the restrictions on resource availability posed by the demands of its primary mission. The public needs to recognize this also and to be better informed as to the military's role and capacity with respect to spills. Any gap between expectations and reality could seriously erode public confidence in the Canadian military and in the federal government's response capacity. We note that the department expressed an interest in being involved in planning activities and its willingness to participate in joint exercises involving transportation and communications, subject to funding.

We do not share DND's view that it is poorly positioned to assist or that it should only assist when a spill is declared a national emergency. As far as we are concerned, DND personnel and assets represent not just another possible resource in the spill response framework, but a unique one. The Department has capabilities that exist nowhere else in Canada. It must therefore work with the Coast Guard, as lead agency, to develop and implement training strategies related to effective oil and chemical spill response. Scenarios for remote locations, notably the Arctic, should be included and personnel and assets should be specifically detailed in national contingency planning.

Recommendation 4-8

The Government of Canada assess the capability of the Canadian Armed Forces to assist in oil and chemical spill prevention and response operations. In conjunction with the lead agency, departmental assets, including personnel, be designated, trained and specifically detailed in appropriate national contingency plans.

Port authorities

At the moment, most ports depend on the Coast Guard; only a few are capable of responding to spills and have equipment within their harbours. As a result of the public hearings, the Coast Guard and the Canada Ports Corporation decided to develop a Memorandum of Understanding to formalize agreement on their respective roles and responsibilities, as well as on response intervention and vessel traffic control in the event of marine spills. The Corporation will ensure that response is initiated without it being necessary to seek an admission of liability from a polluter or to post a bond. As for the Coast Guard, it will attend to the spill and assume management of the response.

We believe that the recent changes in the spill response activities of ports further the notion that the first priority in attending to a spill is to contain it, not to waste valuable time determining who is responsible.

Volunteers

The role of volunteers was addressed in more than 40 submissions presented at the hearings. Some people believed that volunteers were less effective and useful than a trained auxiliary force, while others stated that spill clean-up was a government responsibility and that volunteers should not be used at all. However, the most common opinion was that volunteers could enhance spill response efforts if they were suitably trained, organized and equipped, and if their activities were competently supervised.

We believe that the recommendations arising from the Coast Guard's review of the *Nestucca* response effort and those contained in the special report on oil transportation and oil spills prepared by David Anderson, advisor to the Premier of British Columbia, provide the framework for a national policy on volunteers. These recommendations provide for the training and mobilization of local auxiliary teams from coastal communities. These teams would receive support from various agencies that would be assigned specific administrative responsibilities and help train, supervise and equip volunteers or provide health and logistical support to them.

Recommendation 4-9

To take advantage of local knowledge, and to supplement the clean-up workforce, response operations use local volunteers whenever possible. Persons who volunteer be paid for their services and be covered by workers' compensation for the duration of their involvement in clean-up operations.

Response organization

The Coast Guard's mandate must clearly emphasize the importance of its role as lead agency in marine spill prevention and response. We believe that this role must be given enhanced prominence within the traditional Coast Guard organization, both at the national level and in the regions. Specifically, national and regional spill response operations must not be subordinated to other program mandates and must have sufficient

"A common error in emergency planning is for the planners to forget that they have to inform and educate others concerning their respective roles in emergency situations."

Captain Keith Jones,
Gulf Canada Resources Limited

resources for management, operations, training and key personnel. Moreover, the flow of authority from the Commissioner of the Coast Guard to the National Marine Response Organization and the Regional Marine Response Organization must be direct and unencumbered by management structure or by other program objectives.

The Coast Guard must be viewed nationally and internationally as the unequivocal focal point for response to marine spills in Canada. One of its priorities must be to establish a national marine emergencies response centre. This central unit will be responsible for monitoring national policy; providing operational guidance; facilitating response command and control at all levels, as well as international reciprocal requirements; and overseeing the national and regional teams of On-scene Commanders. It will also have to ensure at least the functional coordination of other key response components.

The marine emergencies response centre should have a national marine spills response team of highly skilled operational response personnel, including chemical spills experts from the Coast Guard, industry and Environment Canada. We appreciate the cost and difficulties of maintaining such a team, but we are convinced that it is essential.

The success of marine spill response also depends on effective contingency plans. Overseeing the development of an integrated set of comprehensive national plans within two to four years should be the first priority of the response centre. This task, as well as the maintenance and updating of these plans, will require a significant allocation of resources.

The importance of training in spill prevention and preparedness warrants resources dedicated to specific tasks that are independent of, or certainly dedicated within, the other major training aspects of the Coast Guard's program. Preparedness and prevention training should address public awareness campaigns, as well as skills directly related to oil and chemical spill response. It will also require the development and delivery of credible programs at various marine institutes and the Canadian Coast Guard College.

As all response efforts entail complex relations between various groups with competing interests, liaison and coordination are of critical importance. It is evident that the resources required to adequately address this must be forthcoming.

Recommendation 4-10

A national marine emergencies response centre be established within the Canadian Coast Guard as the heart of national response operations. This unit be accountable for the effectiveness of future spill response operations.

Contingency planning

Canada has anticipated the need for contingency plans at several levels, but all too often these plans are not complementary. At the international level, Canada has concluded spill response agreements with Denmark and the United States related to spills occurring near international boundaries. At the national level, the Joint Oil Spill Response Emergency Plan (JOSREP) has been prepared by the petroleum industry and the government and provides for industry personnel (but not equipment) to be added to Coast Guard spill response teams.

The Coast Guard's National Marine Emergency Plan sets out how it would respond to oil spills and establishes a framework requiring that regional, district and local Coast Guard staff develop their own contingency plans. Regional marine emergency plans are more detailed than the national plan, while those at the district and subdistrict level are even more specific about response mechanisms and capabilities.

Other public-sector organisms, such as the Canada Ports Corporation, the St. Lawrence Seaway Authority, public ports and harbour commissions have also developed emergency plans for marine spills. In the private sector, refineries, marine terminals and even individual shipping companies have prepared contingency plans of their own. Several municipalities and harbour areas with terminal facilities or significant tanker traffic have also developed marine contingency plans.

We were pleased to find contingency planning taking place, but we were concerned about the inefficiencies arising from the current lack of guidance, coordination and integration. On close examination, it is clear that there is no mechanism in place to ensure that *all the key elements* of spill response operations are included in sufficient detail to be operationally useful. National and regional Coast Guard contingency plans have been independently assessed as being adequate to address modest spills; however, they are not adequate for major or catastrophic spills. Little attention has been given to planning local response to spills, taking into account unique and especially sensitive local conditions. In outlying areas of the Maritimes, the St. Lawrence River corridor, the Great Lakes and coastal British Columbia such planning is critical.

Industry representatives themselves have stated that there is a need to develop a coordinating mechanism for industry and government that is more structured than JOSREP. They have recommended the creation of a "coordinating committee on marine spills", a policy-and-planning body, rather than an operational one, to be chaired by the Coast Guard.

Recommendation 4-11

The recommended Coast Guard national marine emergencies response centre must be assigned the leadership role in contingency planning in both the private and public sector. The centre must integrate all plans on a regional and national basis and ensure that plans meet standard criteria set by the Coast Guard.

Training

How successfully contingency plans are executed depends on how well the participants have been trained. At the public hearings, many people pointed to the need for improved spill response training. The Canadian Petroleum Products Institute believes, and we agree, that improving the breadth and depth of marine spill training for both government and industry personnel would do much to enhance Canada's spill response capability.

Although some organizations do perform contingency training exercises, in the course of the public hearings we heard time and time again of the need for regular realistic exercises and the need to disseminate results. Contingency exercises should be made as realistic as possible by using the actual equipment and involving the people who would be called upon to respond in the event of a spill.

". . . poor contingency plans are almost worse than nothing, for they are likely to breed a false sense of security."

Stu Reeder,
British Columbia Wildlife Federation

Research and technology development

In our interim report, we noted that industry and government had significantly reduced their funding of spill response research and development (R&D) over the past decade and that there was a glaring need for more extensive research into the long-term effects of oil and chemical pollution.

We would like to stress once again that a major collaborative research and development initiative must be undertaken by industry, government and universities to develop effective clean-up technologies and expand our knowledge of the environmental consequences of spills.

The level of expenditure that will be required is high, but it amounts to pennies per tonne of oil and chemicals imported into, exported from, or transported within, Canada by ship and barge. Compared to the cost of cleaning up a catastrophic spill — such as the one from the *Exxon Valdez* — with the technology currently available, it is miniscule indeed. In the pages that follow, we propose a means for financing the required R&D, explain the process by which it should be achieved and identify priority areas where substantial R&D investments are imperative.

"It is rather unusual that consulting groups and government agencies have been awarded almost all of the funds available for oil spill research, while universities were omitted."

Richard Pelczynski, Acadia University

The proposed R&D approach

Due to the complex behaviour, fate and effects of marine spills, and the specialized countermeasures involved, a broad approach is required to improve our knowledge base and response technologies as quickly as possible. Productive R&D requires all the elements of the "innovation chain" — from concept development to technology transfer and commercialization — so that new knowledge may be delivered to where it can be used and more effective spill response techniques and equipment may be developed.

Industry has the primary responsibility for transporting its products safely, preventing environmental damage in the event of a spill, cleaning up after a spill and undertaking the R&D necessary to accomplish this. We believe that industry funds for these purposes should be derived from the revised Ship-source Oil Pollution Fund (SOPF) and a new equivalent fund for chemical spills.

The annual level of Canadian funding, for spill-related R&D at all levels, should immediately be raised to at least $10 million and increase as quickly as the monies can be productively invested. The objective must be to reach $20 million per year within five years.

The R&D program must be coordinated to maximize its value. This can best be accomplished by establishing a committee whose primary responsibility would be the allocation of R&D funds to the most promising and timely projects. The committee should work under the direction of Environment Canada and have strong representation from industry. The Natural Sciences and Engineering Research Council, whose mandate is to ensure that research funds are allocated to Canadian universities in ways which maximize their results, should also be represented on the committee. Moreover, some of the funds should be used to finance unsolicited proposals from researchers and organizations in the private sector.

The committee structure should build on the existing mechanisms maintained by Environment Canada, which already include links with the people who are performing spill R&D in the U.S. and with the relevant sources of funds there. We believe that this approach will bear fruit in the short- and long-term. In the short-term, work will be accelerated on those R&D avenues which already show promise; in the long-term, totally new approaches will emerge which will address some of the current technological roadblocks to effective marine spill response.

Recommendation 4-12

So that the level of Canadian marine spill R&D may be adequate to address the significant lack of knowledge and technology, funding be increased immediately to $10 million and raised annually to reach $20 million by 1995, to be shared equally between government and industry.

Recommendation 4-13

A "Marine Spills Technology Committee" be established as soon as possible. It must work under the direction of Environment Canada and be structured to ensure coordination between industry, universities and government.

Overview of present capabilities

The personnel to perform the necessary R&D, the potential funding mechanisms and the coordinating infrastructure required are already substantially in place in Canada. What is lacking are resources to adequately address the gaps in technology and knowledge in a directed, sustained and substantive fashion.

Government

Environment Canada has coordinated R&D in the past and maintains a number of working/coordinating groups involving representatives from other federal departments, the oil, chemical and shipping industries, Canadian universities and U.S. federal agencies. During the heyday of offshore oil and gas exploration in Canadian waters, Environment Canada was very active in research and development, along with industry, the Department of Energy, Mines and Resources, and Transport Canada. However, over the last 10 years — and particularly since 1986 — there has been a general decrease in expenditures in this area. A case in point is Environment Canada's R&D team at the River Road Environmental Emergencies Technology Centre, which manages the Arctic and Marine Oil Spill Program and has produced a variety of spill response techniques and equipment. The team's research budget has been cut from $2.3 million to $300,000 in 1979 dollars.

Expenditures by the Department of Fisheries and Oceans on oil spill fate and effects, and by the Canadian Coast Guard on equipment evaluation, have remained at around $300,000 and less than $100,000 respectively over the same period.

Other federal funding programs which have supported some R&D in the past, such as the Environmental Studies Research Funds managed by the Canada Oil and Gas Lands Administration (COGLA), the Arctic Marine Transportation R&D Program funded and managed by Transport Canada, the Northern Oil and Gas Action Program managed by the Department of Indian Affairs and

Northern Development, and the Unsolicited Proposals Program managed by the Department of Supply and Services, have been either terminated or severely curtailed.

Industry

In the past, the shipping, oil and chemical industries' contribution to spill R&D has been weak, sporadic and disjointed. Of all the companies that made presentations at the public hearings, only Imperial Oil was able to state that it committed funds annually to environmental R&D (some $1.6 million in 1988-89).

The upstream and downstream ends of the oil industry have done some spill R&D work in the past through cooperative mechanisms like the Canadian Offshore Operators Spill Research Association (COOSRA) and the Petroleum Association for the Conservation of the Canadian Environment, but it was directed towards offshore development and in recent years has declined to virtually zero.

COORSA, which was financed by the oil industry and had an annual budget of $1 million, conducted marine oil spill R&D until the latter half of the eighties. However, with the downturn in offshore oil and gas exploration, it was disbanded, as companies dramatically reduced their R&D expenditures and staff. Industry justified its decision primarily on the grounds that COGLA was administering the Environmental Studies Research Funds (ESRF), being financed through a levy based on a percentage of the value of leases awarded to companies for offshore oil and gas exploration. The ESRF did indeed initially support spill-related R&D, but since 1986 this has been substantially reduced.

There are also companies in the consulting sector in Canada with expertise in spill R&D, though the number of specialists has declined in the last decade due to decreased funding.

Universities

The Natural Sciences and Engineering Research Council has supported spill research at Canadian universities. At the present time, however, the level of its funding is woefully inadequate. We have been told that only the universities of Toronto and Rimouski have developed a good level of expertise in marine spill R&D.

The United States

The decrease in funding of marine oil spill countermeasures R&D has been even more dramatic in the U.S. than in Canada. The total funding from federal agencies in the United States for 1989 was only US$350,000; in the seventies, total federal funding was in excess of $20 million a year. As in Canada, U.S. industry reduced its efforts and retired most of its experts as part of its adjustment to the drop in oil prices.

Since the *Exxon Valdez* spill, however, U.S. government funding has increased by $1 million and planned expenditures for 1990 and 1991 will be $1,350,000 per year. The American Petroleum Institute is expected to match this funding over the next three years and the new Petroleum Industry Response Organization has announced its intention to begin a five-year, $35 million R&D program. Funding for the United States Coast Guard will also be increased by $8 million over the next two years, to enhance its spill response capability.

"The department's (Environment Canada) research budget for oil spills runs between $300,000 and $400,000 which, I believe, is about 1/2000 of the department's budget."

Professor Donald MacKay, University of Toronto

Research and technology development priorities

Most of the spill response equipment presently available is relatively primitive, which makes spill response all the more problematic. It is therefore imperative that the additional equipment purchased as a result of our recommendations be the most effective available.

Canada must place greater emphasis on developing effective clean-up technologies and learning more about the environmental consequences of spills. Since Canada's waters are among the most extensive in the world, the problem is much more significant and urgent here than in most other nations.

We feel that through intensified R&D in the area of spill impact and countermeasures Canada can expand its knowledge base, permitting significant technological advances in both the short and long term.

Since it will not be possible to undertake all the necessary R&D in the short-term, even with increased resources, we recommend that priorities be established as follows:

- Chemical spill response and effects
- Wildlife, waterfowl, and habitat protection and rehabilitation
- Beach clean-up
- Remote sensing
- Waste disposal
- Offshore containment and recovery
- Dispersants

It is our unequivocal conclusion that the single-most important area where an immediate and concerted R&D effort is required is chemical spill response and effects.

Chemical spill technology

At present, there is virtually no technology available for responding to, and mitigating, marine chemical spills. This is due, in part, to the way chemicals react in the marine environment and to their potential health effects. Oil is relatively homogeneous; chemicals are not. When a chemical is spilled into or onto water, it will float, dissolve, sink, evaporate, or some combination thereof. Its behaviour will determine what techniques are used for response.

If a chemical floats, it can — at least in theory — be contained by booms and recovered by skimmers, just like oil. There are, however, complications. Many floating chemicals are very volatile and explosive, which makes it very tempting to just let nature take care of it, from a

Other areas for enhanced R&D

The *Nestucca* and *Exxon Valdez* incidents highlighted the limitations of existing clean-up techniques and the need for an extensive R&D effort. Improvements can only be made if there is a substantial increase in R&D funding and personnel in government, universities and the private sector. Besides R&D in the areas identified in the recommendations, efforts are also required in the following areas:

- In situ burning
- Oil submergence
- Spill behaviour in ice and snow
- Sensitivity mapping
- Sorbents
- Long-term effects of spills
- Health effects
- Fish tainting

safety point of view. Chemicals may also react with the material of the barrier or skimmer. Both of these problems must be investigated in an intensive R&D program aimed at finding solutions for dealing with chemicals.

Chemicals that dissolve cannot be handled at the present time. It is doubtful whether anything can ever be done in the case of large rapid releases, except to protect human health and monitor the extent and level of contamination. There are, however, potential technologies that may be applied to slow releases, such as from a ship which has cracked but not broken up. These must be investigated and the more promising alternatives developed.

Sinking chemicals are also very difficult to handle today. The spill can either be left in the environment in a less harmful condition or be dredged for treatment and/or disposal on land. The technologies for both of these options are underdeveloped. Environment Canada has done preliminary work in this area, but much remains to be done before a viable solution is found.

Recommendation 4-14

To prepare for marine chemical spills, remediation technologies be developed for spills of all chemicals moved in Canadian waters.

Oil spill technology

When oil is released into the water, it first forms a relatively homogeneous layer on the surface. Natural forces rapidly transform this layer into small concentrations of thick oil surrounded by large areas of thin oil or "sheen". Once this has occurred, there are three options for dealing with the slick: containment and recovery, the use of chemical treating agents, or leaving it to nature. (A fourth option, burning the oil on site, is being promoted for use in remote areas, on ice, and among ice floes, but is not yet frequently used operationally.)

Containment and recovery is the option of choice in Canada, the United States and some European countries. This technique consists in using a boom to contain part, or all, of the slick, in order to consolidate it so that a skimmer may recover the oil. Containment should be commenced quickly — preferably within a few hours of the release — to prevent the slick from spreading so rapidly that it overwhelms our capacity to respond with manpower and equipment.

Since booms contain oil by attempting to trap the top layer of water, their effectiveness is drastically reduced when waves are over one metre high and winds are above 25 kilometres per hour. A point is reached where the waves wash the oil over the boom and/or droplets break off from the contained slick and are carried under the boom in the water flow. Because all booms work on the same principle, all fail at about the same relative water velocity of approximately one metre per second. Alternate methods of containing oil have been suggested and some promising preliminary work has been done, but an extensive R&D program is required if substantial progress is to be made quickly.

Skimmers all work on the same principles; they all have limitations and their effectiveness is directly influenced by the state of the sea and the thickness of the slick. If a skimmer can follow the current, it will pick up the oil which is presented to it. However, as the thick-

ness of the oil decreases, so does the skimmer's effectiveness. Debris, emulsions, very heavy oils and high waves all reduce their effectiveness. While North American skimmers are usually ineffective once waves exceed one metre, the more robust systems now available in Europe appear to tolerate wave conditions better. These systems, however, have not been evaluated under Canadian conditions.

As for chemical treating agents, the most common are dispersants, which accelerate the natural dispersion of the oil into the water column by breaking it up into small drops. Their main drawbacks are that they only work with lighter oils, they require surface water agitation to ensure effectiveness, and they must be used within 24 to 48 hours after the spill has occurred.

Since dispersants involve the release of chemicals into the environment, some of which may harm marine life, there is considerable opposition to their use. However, they can be useful in protecting environmentally sensitive areas. *Due to the time factors involved, the decision to use them should be preplanned and pre-authorized.* In addition, research must be undertaken to develop non-toxic dispersants and to improve their effectiveness under typical Canadian environmental conditions.

The third option for cleaning up oil slicks is the "do nothing" option — a very difficult one in the face of political and public pressure to take action. However, in some instances, such as when light crude oil or a refined product is spilled in an area remote from land under severe weather conditions, it may be the only option. Under such conditions, even the best containment and recovery equipment will probably be ineffective and nature will likely break up and disperse the oil without the need for chemicals. With the exception of burning, doing nothing is often the only option for ice-infested waters, where containment and recovery and the use of dispersants are ineffective.

Regardless of the option chosen, there is always the risk that the oil will eventually reach the shore. This possibility calls for the strategic positioning of booms to protect the most sensitive coastal areas. If oil reaches the shore in spite of this, the difficulty of the clean-up will depend on the amount and nature of the oil and the type of shoreline. In general, heavy, viscous oils are easier to remove from sandy shores than light oils, while the converse is true for rocky shores. Pebble and cobble beaches, on the other hand, are always difficult to clean.

The technology available for cleaning up accessible sandy beaches ranges from heavy construction equipment to off-site incineration and washing. All methods involve removing the top layer of the beach, which will cause environmental damage. The only alternatives are shovels or water flushing — both very labour intensive. For rocky shores, only the widespread use of sorbents or flushing are available. Again, both are labour intensive. In the case of pebble or cobble beaches, some of the technologies for sandy beaches may be used, but are much less effective and more time-consuming. A significant R&D effort is required to improve shoreline clean-up technology.

"Concerning oil spill response, there are four universal steps: 1) secure the source; 2) contain, deflect and protect; 3) recovery and clean-up; and 4) disposal."

Ron Whitehorn,
Canadian Coast Guard

Recommendation 4-15

To enhance Canada's ability to clean up oil spills on shore:

- *Current shoreline clean-up research be expanded and accelerated.*
- *Research be done into improved containment and recovery techniques and other promising methods of dealing with oil at sea. It include evaluation of the newer European technology under Canadian conditions.*
- *Countermeasures for oil spills among broken ice be pursued.*
- *Research into more effective dispersants be accelerated and pre-authorization of the use of dispersants be considered for protection of environmentally sensitive areas, where their advantages outweigh their disadvantages.*

Remote sensing

Remote sensing, as defined for oil spills, is the technology used to locate spills, map their extent, determine the amount of oil present and assist in countermeasures planning. As was demonstrated at the time of the *Exxon Valdez* incident, when Canadian remote sensing contributed very directly to establishing or confirming clean-up priorities, this technology can be crucial for effective response.

In the late seventies, Canada was a world leader in remote sensing technology. The Centre for Remote Sensing of the Department of Energy, Mines and Resources, in conjunction with Environment Canada's Environmental Emergencies Technology Division, developed a remote sensing unit which set the standard throughout the world. Unfortunately, Canada has not itself used this equipment.

Current remote sensing equipment can locate oil spills, but cannot determine how much was spilled or how thick the layer of oil is. Recent cooperative research (sponsored by the Environmental Emergencies Technology Centre, industry and U.S. government agencies) is leading to systems that will overcome these deficiencies. However, enhanced funding and effort will be required to produce operational equipment.

It is important to distinguish between remote sensing capacity and aerial surveillance used to detect and deter vessels discharging pollutants. The equipment generally used in surveillance is much less sophisticated than that used for remote sensing. In Chapter 3 we recommend that dedicated surveillance aircraft for all our coastal waters be made available.

Recommendation 4-16

To ensure effective tracking of spills, Environment Canada be given the resources to:

- *establish a remote sensing system capable of locating spills in all Canadian waters and mapping their dispersion;*
- *accelerate research into remote sensing and the development of more modern systems that overcome the deficiencies of existing technology.*

Waste disposal

Spills which reach the shoreline, and some which do not, result in large quantities of oil-contaminated debris. At the moment there are only two commonly used methods of disposing of this: landfilling and burning. Each of these can potentially lead to environmental and jurisdictional disputes. It is therefore essential that the provincial, territorial and municipal governments be consulted before any action is taken.

Handling oil spill debris is a problem often compounded by the fact that the debris may include decaying animal and vegetable matter along with the oil. In the past, landfilling was the preferred disposal technique but it is now viewed with disfavour because of potential ground water problems. Incineration is frequently used, but is not always possible. There have also been some reported attempts at bioremediation and solvent extraction, but these are fairly new fields about which little is yet known.

Recommendation 4-17

To facilitate the disposal of oiled debris resulting from spill clean-up operations:

- *the Canadian Coast Guard, as lead agency, ensure that all levels of government involved agree on, and pre-authorize, temporary storage as well as treatment sites for marine spill waste materials along all marine transportation routes;*
- *landfilling of oiled debris must not be practised where alternatives are possible;*
- *research into better methods of treating oil spill debris must be undertaken as a high priority.*

To improve the effectiveness of current technology, it is critical that there be opportunities for testing under operational as well as controlled situations. Contingency plans should therefore provide for this and actual deployment permission should be given by response authorities whenever possible.

Recommendation 4-18

Whenever possible, the On-scene Commander assist R&D efforts by permitting the testing of new response equipment at spill sites.

Monitoring Canada's state of preparedness

The present uneven capability to respond to marine spills in evidence across the country, and the inconsistency in the quality and content of contingency plans — where they exist — underscore the need for regular monitoring of Canada's state of preparedness. This monitoring responsibility must be clearly reflected operationally by the Coast Guard, as the lead agency for marine spill response. As the functional agency responsible for environmental protection, Environment Canada must independently audit and assess the Coast Guard's performance in this area.

We note the willingness of oil and chemical associations to cooperate in independent audit activities. This must be formalized by memoranda of agreement relating to the development and approval of all contingency plans and their testing, as described previously.

Establishing a well-integrated national response framework is a formidable task. Many of the key initiatives cannot be realistically launched until financial requirements have been

"We have only one supply of natural gas, one supply of oil, one environment, one set of oceans. When the oceans no longer sustain life, they are dead. The environment dies with the ocean. So do we — all of us."

Otto Peace, Victoria

assessed and funds have been allocated. Given past marine spill funding trends, both nationally and internationally, there is cause for concern. A means of translating the good intentions of government and industry, as well as their commitment, into sustainable action must be found. Making it compulsory for the Minister of the Environment to report to Parliament on the implementation of spill response plans would help to assure Canadians that Canada will be adequately prepared for marine spills in the future.

We believe that within one year a comprehensive national marine spill response plan must be developed under the auspices of the Coast Guard, as lead agency. This plan must be audited and assessed by Environment Canada, as the functional agency, and submitted for detailed government review and approval. In addition, it should include confirmation of target response capacities and the organizational components and responsibilities at all levels.

Recommendation 4-19

Under the auspices of the Coast Guard, a comprehensive plan for implementing a national marine spill response framework be developed for detailed review and approval. This plan be specific as to response capacities addressed and be developed within one year. An independent assessment of the plan be conducted by Environment Canada and progress reports submitted annually to Parliament by the Minister of the Environment.

Chapter five

Legislative framework

Introduction

As a nation with an extensive coastline and a very small merchant marine, Canada has a vital interest in a strong system of international cooperation on matters related to tanker safety and compensation for damages resulting from spills. Because Canada is not a large player in the international shipping industry, and because the greatest risk of major oil pollution to its waters comes from foreign-flag tankers carrying oil into Canadian ports, or passing through en route to foreign ports, Canada's ability to protect its coastal waters is enhanced through cooperation with other nations.

Viewed from this perspective, it is not at all surprising that Canada is presently party to 11 International Maritime Organization (IMO) conventions, and is likely to participate in others shortly. Coupled with these international conventions, Canadian maritime law forms a fairly comprehensive framework that serves our interests well. Moreover, within the limits of Canadian jurisdiction, our domestic laws provide for enforceable standards, and Canadian provisions for compensation go beyond the minimalist, and at times inadequate, levels of international regimes.

While comprehension of how this system of maritime law operates is vital to a clear understanding of many of the issues relating to spill prevention and response, it would be tedious and time-consuming to assess each component separately. Suffice it to say that the international regime — for all its many and obvious benefits — also places limitations on what Canada can realistically

International Marine Transportation Routes for Petroleum

do as a sovereign nation to improve tanker safety or to enhance liability and compensation regimes for damages resulting from oil pollution.

Rights of innocent passage, flag-state versus port-state rights, the need to have international agreement on vessel design, and manning and crew certification standards, each limit to some degree the scope and rigour of Canadian legislation. However, the alternative to this international regime would be chaos. This point is a crucial one and must be understood.

Canada can oblige its vessels to respect standards and adopt practices far beyond those required internationally. In theory, it can also oblige foreign-flag ships to adhere to these higher standards. In practice, however, it does not, because of the limitations imposed on it by virtue of its accession to international conventions and because it would likely face some form of international censure were it to act unilaterally in ways that went beyond convention-sanctioned practices.

Even if Canada decides that a given region just outside its internal or territorial waters has such unique environmental sensitivity that tanker traffic should not be permitted, it must follow the procedure established by international convention to have that exclusion zone recognized by foreign-flag vessels.

In this chapter, we shall describe the components of the present international regime and review several issues emanating from it that are particularly germane to our mandate. We shall also explain the statutory framework currently in place in Canada and assess its strengths and weaknesses. Finally, we shall address a range of issues we feel must be dealt with to ensure the effectiveness of the legal regimes to protect Canadian interests from loss, damage or expense from ship-source pollution.

"There's no point in requiring a Canadian fleet consisting of 40 tankers or fewer to be converted and not have the chance to compete with all the rest. It's absolutely necessary that these recommendations be carried out internationally."

Joe Shormann,
Nutak Horizons Inc.

International regime

It is important to recognize that regimes governing marine pollution damage and liability of shipowners, both nationally and internationally, have two components. First, there are rules governing the design, construction, equipment and operation of ships. Into this category would fall those *technical rules* intended to prevent or limit discharge of pollutants from ships. Secondly, there are rules pertaining to *liability and compensation* for damage caused by discharge of pollutants.

Technical conventions

The first convention with which we need be concerned is the 1974 International Convention for the Safety of Life at Sea (SOLAS). This convention substantially replaced and updated earlier SOLAS conventions of 1948 and 1960, which focused on establishing standards for the design and construction of vessels. It also upgraded construction and machinery standards, as well as navigational, firefighting and lifesaving equipment requirements. To a large extent, vessels built to previous SOLAS standards were excluded from most of the new requirements.

Pollution prevention conventions

SOLAS addressed vessel safety in general, but the first convention to deal specifically with the problem of oil pollution was the 1954 Convention for the Prevention of Pollution of the Sea by Oil (OILPOL '54). While SOLAS minimized accidental pollution via vessel safety, OILPOL '54 was designed to minimize oil discharges from routine ship operations by controlling the pumping of oily water mixtures from bilges

and tank washings. It established maximum volumes tankers would be permitted to pump (one hundred parts of oil per million parts of water), rather than simply allowing unlimited discharging. As the Convention left it entirely up to flag states to prosecute contraventions, and since there was no requirement for ships to have equipment to monitor the quantity of oil being pumped, the agreement was for all intents and purposes voluntary.

Because of mounting pressure resulting from the oiling of beaches throughout the world, particularly in the Mediterranean, amendments were made to OILPOL '54 in 1962, 1969 and 1971. These amendments introduced measures such as tank size limitation, and strengthened some of the previous criteria on the discharging of oily water mixtures at sea.

MARPOL

During the latter part of the sixties and into the early seventies, there was great concern over the state of the global environment, including the ever-increasing volumes of oil entering the world's oceans. For the marine environment, the galvanizing event was the 1967 *Torrey Canyon* disaster, as a result of which 117 000 tonnes of oil were spilled off the south coast of England. The *Torrey Canyon* became a potent international symbol of the need for concerted action to protect the world's waters. In many ways, the incident was the catalyst for the conference that eventually led to the International Convention for the Prevention of Pollution from Ships, 1973, known as MARPOL '73, and for the creation of the IMO's Marine Environment Protection Committee.

In 1978, when it was discovered that a steering gear breakdown had caused the *Amoco Cadiz* incident which released 220 000 tonnes of oil onto the beaches of Brittany, pressure for increased control of pollution from oil tankers mounted further. A conference was held once again, from which emerged two protocols: the Protocol of 1978 relating to SOLAS 1974 and the Protocol of 1978 relating to MARPOL '73.

The conference was initiated by both the Maritime Safety Committee and the Marine Environment Protection Committee of the IMO, in recognition of the fact that tanker safety had to be addressed through both SOLAS and MARPOL. As such, SOLAS provisions regarding the construction and equipment requirements of vessels were brought together and updated along with those of MARPOL pertaining to protectively located segregated ballast tanks. Both protocols are now in force, MARPOL having been acceded to by 57 nations accounting for 85 per cent of the world's shipping tonnage.

In 1987, by adopting amendments to the *Canada Shipping Act* (CSA), Parliament laid the groundwork for eventual accession to MARPOL, likely in 1991. The necessary regulations are now being prepared.

The oily waste pumping provisions of MARPOL '73 and '78 apply to all vessels, not only to tankers. As such, they offer a very broad regime with respect to operational oil spills. This is an exceedingly important point: *while accidental tanker spills are the most feared type of major spill, minor spills from the daily operations of the fleets of the world cause far more marine pollution.* MARPOL provisions require every vessel over 400 tonnes (gross tonnage) to have an oily water separator for discharges from machinery spaces. They

"No charterer, given the choice, would charter a bad ship for the same price as a better ship, if only he knew or had the information beforehand."

Captain Barry J. Scott, Scott Marine Technical Services Limited

also establish the following criteria governing the discharge of oily waters at sea: 15 parts per million within 12 miles[1] of a coastline and 100 parts per million beyond 12 miles, including deep sea.

In addition, all tankers over 150 tonnes (gross tonnage) must have equipment to monitor the rate of discharge of oily water from tank-washing and ballast operations. This water can be discharged at a maximum rate of 60 litres per mile, and *only* when the vessel is at least 50 miles offshore and under way. For oil tankers built before 1979, maximum discharge rates must not exceed one fifteen-thousandth of their cargo dead weight. For those built after 1979, the discharge rates must not exceed one thirty-thousandth of their cargo dead weight.

In addition to pollution by oil, which is dealt with in Annex 1, MARPOL also covers pollution by chemicals, both in bulk (Annex 2) and packaged (Annex 3), as well as sewage (Annex 4) and garbage (Annex 5). Adoption of the first two annexes is a condition of accession to MARPOL, while the remaining three are optional. We believe Canada should adopt all five annexes now. (Canadian standards with respect to sewage currently exceed those of Annex 4 and should continue to apply.)

Annexes 2 and 3 are particularly important to the chemical industry, which indicated that it would welcome the development of consistent international guidelines for the transportation of chemicals. Annex 2 applies to " . . . all ships carrying noxious liquid substances in bulk", and the second appendix to it provides a long list of named chemicals, placed into four categories, and defines the type of ship in which each category must be carried. Annex 3 covers noxious substances in packaged form, which are carried almost exclusively in container and general cargo ships. (Canada has achieved much the same result sought in Annex 3 through implementation of the International Maritime Dangerous Goods Code, an IMO document, although there are minor differences between the two.)

Annex 4, which concerns ship sewage, has not yet come into force, but Annex 5, which deals with ship garbage, has obtained the necessary conditions for entry into force. As garbage causes considerable damage to Canada's marine environment, Annex 5 has the potential to improve the situation.

MARPOL also requires member states to provide adequate discharge facilities to handle any quantity of oily waste which cannot be disposed of by the limited method permitted under the Convention, and Canada will have to do this to make MARPOL work. Canada's ultimate aim should be to require that vessels discharge all their oily waste prior to sailing from their last Canadian port, in order to avoid unnecessary pumping of oily wastes off our coasts.

Recommendation 5-1

Canada accede to all five annexes of MARPOL in order to limit the discharge of oil off its coasts, to provide for safe carriage of bulk and packaged chemicals, and to limit environmental damage resulting from the discharge of sewage and garbage from ships. (Existing Canadian standards with respect to sewage should continue to apply.)

The *Exxon Valdez* catastrophe last year once again increased pressure for improved protection from oil tanker pollution. As a result, an IMO conference is scheduled for November of this year. Its main purpose will be to establish an international information centre to: maintain a listing of spill response centres

and their capabilities, an inventory of response equipment, a directory of experts in pollution response and salvage, and worldwide oil spill statistical data; find ways to facilitate the dispatching of these experts and this equipment to spill sites (by reviewing such issues as customs requirements and transportation); and provide technical assistance and advice on spill prevention and clean-up. Whether or not the conference will also address vessel construction standards remains to be seen.

Civil liability and compensation conventions

There are presently two international conventions in force governing liability and compensation for oil pollution damage. They are the 1969 International Convention on Civil Liability for Oil Pollution Damage ('69 CLC) and the 1971 International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage ('71 Fund Convention).

The origins of both conventions can be traced back to the *Torrey Canyon* incident, which exposed two categories of problems with the international law regime then in place. First, there was doubt internationally as to what measures a coastal state — in this case the United Kingdom — could take against a foreign-flag tanker in difficulty at a location outside its territorial sea, but threatening to do damage to its coastline and related interests. Secondly, it was clear that the international arrangements governing liability and compensation for clean-up costs and damage caused by the incident were insufficient.

In light of the need to develop measures to deal with these issues, the IMO organized the International Legal Conference on Marine Pollution Damage in 1969, from which emerged the '69 CLC. This convention governs the liability of shipowners for oil pollution damage, establishes the principle of strict liability (i.e., with certain prescribed defences), and creates a system of compulsory liability insurance. It is restricted to laden tankers carrying persistent oil and establishes a limitation of liability of about $200 per tonne (usually expressed in terms of Special Drawing Rights), with an upper limit of about $21 million. This limitation only applies if shipowners can prove that the events giving rise to the claim occurred without their "actual fault or privity". If they cannot, their liability is unlimited.

The '71 Fund Convention led to the creation of an international fund to supplement the compensation payable under the CLC. This fund, financed in most states by companies that annually receive more than 150 000 tonnes of "contributing" oil in bulk by sea, is used to compensate victims of oil pollution damage up to a maximum of about $90 million in respect of any one incident. This amount includes any compensation available under the CLC.

If shipowners are not liable, or where they are liable but cannot meet their liabilities, the International Fund pays the full compensation due, up to the prescribed maximum. Canadian contributions to the Fund are paid directly from the Ship-source Oil Pollution Fund (SOPF) described on page 87.

The '69 CLC and the '71 Fund Convention both apply to oil pollution damage in the 12-mile territorial sea and in Canadian territory, even if the incident actually causing the damage occurred outside the territorial sea. Both conven-

tions were implemented in the *Canada Shipping Act* by the amendments which came into force in 1989.

1984 Protocols to '69 CLC and '71 Fund Convention

By the early eighties, it had become clear that the original compensation levels provided for under the '69 CLC and the '71 Fund Convention were insufficient for major disasters. Thus, in 1984, an international conference adopted two protocols, one to the '69 CLC, the other to the '71 Fund Convention. These protocols will increase substantially the compensation available under the two conventions. When they come into force, they will, in our view, represent considerable progress over the present regimes.

The 1984 Protocols would: expand the coverage of the '69 CLC and the '71 Fund Convention to include tankers in ballast and combination carriers whose last cargo was oil; broaden the definition of "pollution damage"; and extend the geographic area covered by the oil pollution damage provisions of the two conventions. This broadening of the circumstances under which compensation would be made available and the increase in the amounts payable under the International Fund proposed in the Protocols, could in many cases reduce or eliminate some of the SOPF's exposure.

The Protocols would also provide for higher levels of compensation which would be implemented in two stages. The first stage would increase the combined CLC and Fund Convention coverage from its present $90 million to roughly $202 million. This would occur once the Protocols are in force and eight states have reported combined imports of "contributing" oil of at least 600 million tonnes per year. The second stage would increase coverage to roughly $300 million once three parties to the conventions have reported combined imports of "contributing" oil of at least 600 million tonnes in the previous calendar year.

The 1984 Protocol to the CLC makes a significant change with respect to the right of shipowners to limit their liability. Under the '69 CLC, limitation only applies if shipowners can show that the events giving rise to the claim occurred without their "actual fault or privity". The 1984 Protocol shifts the onus onto the claimant to show that the shipowner caused the incident intentionally or recklessly.

In considering accession to the 1984 Protocols, one must be cognizant of the implicit trade-off it imposes: a higher limitation of liability figure in return for making the limitation of liability substantially unbreakable. In our view the question now is whether (or when) to accede to the 1984 Protocols.

If Canada ratifies the 1984 Protocols before the second stage of compensation is reached, it will accept, with other contracting countries, a greater obligation to share in the costs of clean-up and compensation for environmental damage worldwide. In light of the additional protection already afforded by the SOPF, this might prove to be a very expensive way for Canada to acquire some $110 million in additional coverage.

On the other hand, if, and when, the second stage of the Protocols comes into effect, the total compensation available from the International Fund will reach approximately $300 million. Canada's pro rata share of clean-up and damage expenses would be far less because the expenses will be shared by more states, including most of the world's large oil importers. At that point, the 1984 Protocols should be ratified.

"International conventions are often silent on unmanned oil barge standards, whereas specific requirements are established for similarly sized tankers."

Richard Dupuis,
Imperial Oil Limited

The table below shows the levels of compensation available for damages resulting from oil pollution under the international regimes.

Convention	Max Limit (millions)
CLC	$21
CLC 1984 Protocol	$89.6
CLC + Fund*	$90
CLC + Fund (1984 Protocols)	$202 / $300

* This regime was incorporated into the *Canada Shipping Act* effective 1989.

Recommendation 5-2

To increase the funding available for compensation of damages caused by spills, Canada ratify the 1984 Protocols to the '69 CLC and the '71 Fund Convention as soon as the second stage of compensation is reached.

Protection and Indemnity Associations

To insure themselves against the third party liability risks of operating a vessel, shipowners formed associations known as Protection and Indemnity Associations (P&I Clubs). As the CLC imposes compulsory liability insurance requirements on shipowners, P&I Clubs issue confirmation of insurance to them, so that state administrators can then issue Certificates of Financial Responsibility. This constitutes evidence that the shipowner is in fact insured at least up to the CLC's compulsory limit.

While the 1984 Protocols are not yet in force, we understand that in January 1990 P&I Clubs agreed to begin issuing certificates which meet the Protocols' second-stage liability limitation threshold of $202 million.

In addition to covering compulsory liabilities imposed by the CLC, P&I Clubs also provide marine insurance to shipowners for a number of other liabilities. Coverage for oil pollution damage is up to a maximum of US $500 million, although an additional US $200 million can be obtained.

The 1989 Salvage Convention

When a ship and its cargo are saved from danger of loss or damage, the person who saved them is entitled to a "salvage" award. Maritime law, unlike common law which does not reward services which are volunteered, encourages salvors by giving them a generous award based on the value of the property saved and the danger to which it and the salvor's vessel were exposed. It also grants them a maritime lien on that property to secure payment of the award. This principle has been recognized in maritime law since about 1100 A.D.

Most salvage services are performed under a Lloyd's Open Form salvage agreement by the terms of which salvors agree to work on a "no cure, no pay" basis. If the salvage attempt is unsuccessful, salvors receive nothing and have to bear their own loss of time and expenses.

Many shipowners prefer to contract with salvors on an agreed daily rate basis in order to avoid being faced with having to pay a potentially larger salvage award. Sometimes negotiations are lengthy, the salvors refusing to accept a daily rate contract and the shipowners holding out until their ships are in such danger that they are forced to accept a Lloyd's Open Form. It has also been asserted that there are unnecessary, and often dangerous, delays because masters do not have the authority to enter into salvage agreements on behalf of shipowners. Finally,

some concern has been expressed over the fact that salvors may refuse the assistance of other salvors, in order to preserve the whole of the potential salvage award for themselves.

Salvors occasionally arrive on the scene, assess the chances of a successful operation, and decide it is not worth their time and expense to make a salvage attempt. They might then be asked by the shipowner to stay on the scene and try to avoid, minimize or clean up oil pollution, but most salvors are not specifically equipped for this task. In such cases, there is no property against which to enforce a lien, and salvors would be liable if their negligence increased the damage.

The above difficulties led many in international circles to question the "no cure, no pay" principle. Indeed, it was felt that clarifications and adjustments were needed so as to encourage salvors to act promptly and effectively to both salvage vessels and minimize potential environmental damage.

On April 28, 1989, an IMO-sponsored international conference approved a convention designed to resolve these problems. The International Convention on Salvage, 1989 (1989 Salvage Convention) revised the 1910 Convention for the Unification of Certain Rules of Law Relating to Assistance and Salvage at Sea.

The 1989 Salvage Convention emphasizes protection of the environment from damage by pollution, which is defined as " . . . substantial physical damage to human health or to marine life or resources in coastal or inland waters or areas adjacent thereto . . . " It provides for special compensation to salvors who have carried out salvage operations when a vessel or its cargo threatened damage to the environment, which the salvors have prevented or minimized. In these circumstances salvors are entitled to receive their expenses from the owner of the ship, but this special compensation can be increased by 30 to 100 per cent, depending on the circumstances, by a tribunal adjudicating on these issues.

To facilitate the parties reaching a salvage contract, the Convention authorizes the master to contract on behalf of the owner of the vessel, and the master or shipowner to contract on behalf of the owner of the cargo. It also requires that the salvor carry out the salvage operations with due care and exercise due care to prevent or minimize damage to the environment. The salvor must also accept the intervention of other salvors when reasonably asked to do so by the owner or master of the vessel.

The Convention further requires the master, the shipowner, and the owner of the property in danger to cooperate fully with the salvor, to exercise due care to prevent or minimize damage to the environment, and to accept redelivery of the vessel or property at a place of safety when reasonably requested by the salvor to do so. So far as the reward is concerned, it remains on a "no cure, no pay" basis.

The problems which the Convention is designed to resolve arose in Canada for the first time in 1972 with the grounding of the *Vanlene* on the west coast of Vancouver Island. The "special compensation" provided by the Convention is the result of a compromise between the interests of salvors, cargo owners and shipowners first proposed by the Canadian delegation at a *Comité maritime international* conference held in Montreal in 1981, and became known internationally as "The Montreal Compromise". These provisions were carried forward to the IMO diplomatic conference where they were accepted. Thus, the terms of the

Convention are important to Canada, were mainly put forward by Canada, and the Convention should be ratified by Canada.

Recommendation 5-3

Canada ratify the International Convention on Salvage, 1989, in order to encourage salvors to prevent, minimize, or clean up pollution.

Canada's domestic regime

Fulfilling our international obligations

In 1987, Parliament passed legislation to give effect to the '69 CLC, the '71 Fund Convention and MARPOL. This was done through amendments to the *Canada Shipping Act*, specifically Part XV (prevention and control of

Canada's Ship-source Oil Pollution Fund

The 1973 Maritime Pollution Claims Fund (MPCF) was established to provide a source of compensation additional to the rights of claimants directly against shipowners in instances of ship-source oil pollution. It was financed by imposing a 15 cent per tonne levy, effective on February 15, 1972, on each tonne of oil imported into Canada by ship or shipped from any place in Canada. The levy was discontinued on September 1, 1976 by the Minister of Transport when the MPCF's balance reached $39 million. Since then, compounding of interest has brought its balance to $163 million (as of March 31, 1990).

The MPCF was developed as a stand-alone fund when Canada did not have access to the International Fund. However, when Canada acceded to the '69 CLC and the '71 Fund Convention in 1989 and incorporated their provisions into the *Canada Shipping Act*, it gained access to the International Fund for payment of claims. Nonetheless, a decision was made to retain the Canadian fund, modify it in light of experience gained, and rename it the Ship-source Oil Pollution Fund (SOPF). In addition to the previous availability of the MPCF to cover lost income of fishermen, clean-up costs and the costs of preventive action, the SOPF is available for:

- use as an "excess fund" to cover any portion of claims exceeding the funds available under the '69 CLC and the '71 Fund Convention, to a maximum of $100 million (indexed to $105.5 million in 1990) per incident;
- meeting claims that might not be covered by the International Fund, which applies only to laden tankers. (The Canadian fund covers spills from any ship. In the case of "mystery spills", the onus is on the fund's administrator to show that the spill did not come from a ship.);
- meeting claims against a shipowner who is financially incapable of paying the limited liability portion of the damages;
- paying Canada's contribution to the International Fund;
- meeting claims resulting from oil pollution damage suffered outside the territorial sea, but within Canada's fishing zones.

The amendments to the Canada Shipping Act which came into force in 1989 also increased the amount of the levy and indexed it, so that if imposed today, it would be 31.65 cents per tonne.

pollution) and Part XVI (liability and compensation for pollution), which received royal assent in 1987 and were proclaimed in April 1989. These amendments gave effect concurrently to the '69 CLC and the '71 Fund Convention, which together make compensation available up to a maximum amount of $90 million in respect of any one incident involving a tanker carrying persistent oil. MARPOL will likely come into force in Canada in 1991, once it is formally acceded to.

Ship-source Oil Pollution Fund (SOPF)

Recent experience demonstrates clearly that the $163 million now in the SOPF is not adequate to deal with a major spill. Collection of the 31.65 cent per tonne levy last year would have raised more than $12 million, in addition to the interest earned by the Fund. Nonetheless, given the demands which the Fund may be called upon to meet, and those which we propose to add, the levy should be raised to $2 per tonne. The Minister of Transport has the authority to impose the levy at any time. In our view this should be done at once.

The amendments to the *Canada Shipping Act* which came into force in 1989 led to modifications in the SOPF. These included limiting the liability of the Fund to $100 million (indexed to $105.5 million in 1990) for each occurrence; broadening its coverage (to cover loss of income not only for fishermen, but also for fish processors, workers in certain types of fish processing plants, sport fishing boat operators, etc.); and permitting claimants to claim directly against the SOPF, thus obliging the Fund's administrator to settle legitimate claims quickly and then, in turn, claim against the shipowner or the International Fund, as appropriate.

Another especially important modification was to make the SOPF available to compensate claims for oil pollution in Arctic waters in respect of Convention ships (tankers loaded with persistent oil). Since the previous regime did not apply to the Arctic at all, this represents a significant improvement.

In recommendation 2-1 (Chapter 2), we dealt with the imposition of the levy. For convenience, we reproduce that recommendation here. *The Minister of Transport should immediately impose a levy of $2 per tonne on all oil and oil products transported in Canadian waters. The levy should be paid into the Ship-source Oil Pollution Fund, whose purpose should be expanded to expedite replacement of the Canadian-flag fleet with double-hulled vessels and to fund spill response research and equipment purchases.*

The CSA and the AWPPA

While there are several pieces of Canadian legislation which address the subject of ship-source pollution, the principal statutes governing the safety of navigation, the operation of ships, their construction and equipment, and the prevention and control of ship-source pollution are the *Canada Shipping Act* (CSA) and the *Arctic Waters Pollution Prevention Act* (AWPPA). It is primarily through these Acts that Canada implements the international maritime conventions that it adopts.

The CSA, first consolidated in its current form in 1934 and amended from time to time since, regulates all facets of shipping. The AWPPA, on the other hand, was enacted in 1970, one year after the voyage of the American supertanker *Manhattan* through the Northwest Passage, when it was recognized that special

Table A
Summary of Canadian Legislation

	Liability	Limitation of Liability	Penalty	Requires Contingency Plan	Imposes Duty to Remedy
CSA	Strict (direct damage, clean-up) if SOPF, loss of income	$200 per tonne,* to a maximum of $21 million	Max $250,000	No	No
AWPPA	Absolute against shipowner; some defences to shipowner's insurer	Same as CSA	Against person: max $5,000 Against ship: max $100,000	No	No
Fisheries	Absolute (clean-up costs and loss of income for fishermen	None	Max $50,000 (1st offence); max $100,000 (2nd and subsequent)	Yes	No
CEPA	Costs of measures to remedy, reduce or mitigate danger to the environment	None	Max $300,000 or 6 months (summary conviction); max $1 million or 3 years (indictable)	Yes	Part II & IV: yes
OGPCA	Absolute (direct damage, clean-up costs, loss of income)	If negligence, no limit. If no negligence, $25 million or $40 million (except where AWPPA applies)	Max $100,000 (summary); max $1 million (indictable)	Yes	Yes
WACSA	Absolute (actual and future wildlife harvest lost, damage to harvesting tools and property)	No statutory limits. Limits may be pre-negotiated case by case	No	Yes	Compensation for mitigative and remedial measures. No specific duty to remedy
CPCA	Polluter liable for damages to port property and removal of nuisances	None	$500 or 30 days	No	No
SSAA	No specific provision; common law applies	No specific limit of liability	Max $1,000	No	No

* Dollar figures obtained by conversion of Special Drawing Rights at a rate of $1.50.

"The Government of Yukon believes that the best policy is to have no traffic at all. We simply cannot afford any tanker risk."

Piers MacDonald (Minister), Government of Yukon

statutory provisions were required with respect to Arctic waters. No significant amendments have been made to it since that date.

The CSA applies to all ships in Canada's internal waters and in its territorial sea, and to Canadian ships in all other waters. The pollution control provisions of the Act, as well as those relating to the safe operation of ships, also apply to all Canadian waters and fishing zones, except where the AWPPA applies.

The body of Canadian maritime legislation respecting pollution of coastal waters also includes the *Fisheries Act*, the *Canadian Environmental Protection Act* (CEPA), the *St. Lawrence Seaway Authority Act* (SSAA), the *Canada Ports Corporation Act* (CPCA), the *Oil and Gas Production and Conservation Act* (OGPCA), and the *Western Arctic (Inuvialuit) Claims Settlement Act* (WACSA).

Table A summarizes some of the essential characteristics of each statute as it relates to oil pollution.

While this body of statutes is imposing, the challenge we faced in our review was that of determining whether or not these various pieces of the puzzle were complementary and mutually reinforcing. Our first conclusion is that the overall body of legislation lacks uniformity and consistency. Depending on where an incident occurs, and under what piece of legislation prosecution is undertaken, maximum fines for an incident may vary considerably. Some statutes require the development of contingency plans and impose a duty to remedy, while others are silent on these issues. In our view the penalty provisions of, and obligations under, existing legislation should be made more uniform and consistent. Secondly, limitation of liability provisions vary significantly between statutes. While this in itself is not necessarily bad, as each statute was designed to address a specific problem, similar incidents should be treated in similar ways.

In the following pages, we make recommendations to eliminate these shortcomings.

Protecting the Arctic

Under the AWPPA, the shipowner is deemed to have "absolute liability" without fault or negligence being proved. The owner's only defence therefore is to prove that the incident was caused by another person. On the other hand, under the CSA, the owner has "strict liability" without fault or negligence being proved, but the CSA recognizes such defences as acts by war, intentional damage by third parties, or wrongful acts by authorities responsible for navigational aids.

There is also a significant difference between the two Acts with respect to the amount to which shipowners can limit their liability. Under the CSA, the limitation is calculated at about $200 per tonne, to a maximum of about $21 million for oil pollution damage, but shipowners can only limit their liability to this amount if they can prove that the events giving rise to the claim occurred without their "actual fault or privity". If they cannot, their liability is unlimited. The AWPPA adopted the same limitation of liability figures. Consequently, shipowners may limit their liability to $200 per tonne, to a maximum of about $21 million. While the liability regime under the AWPPA may superficially appear to be "absolute", there is no provision in it for breaking liability limits.

Recommendation 5-4

The Arctic Waters Pollution Prevention Act *be amended to adopt the same limitation of liability regime as found in the* Canada Shipping Act, *requiring owners wishing to avail themselves of the limitation of liability to prove that the event occurred without their actual fault or privity.*

In Canadian waters not covered by the AWPPA, the SOPF is available to compensate for oil damage from both Convention and non-Convention ships. Compensation would first be obtained from the shipowner's liability fund and then from the SOPF. In contrast, in waters covered by the AWPPA, the SOPF is only available in respect of oil pollution damage from Convention ships.

Oil pollution caused by a spill of a ship's bunkers (i.e., fuel) can damage the environment just as seriously as an oil cargo spill. Also, because most of the ships transitting the Arctic are relatively small, the owner's limit of liability is very low. For example, the liability for the largest tanker operating in the Arctic is between three to four million dollars. This is a significant gap in the liability and compensation regime for Arctic waters. No one is liable for damages in excess of the owner's limit of liability for freighters or tankers when not carrying oil. Accordingly, we believe that the compensation provisions of the SOPF should apply to all ships in Canadian waters, including those north of the 60th parallel that are covered by the AWPPA.

Recommendation 5-5

Existing legislation be amended to provide that the Ship-source Oil Pollution Fund apply to all ships in waters covered by the Arctic Waters Pollution Prevention Act.

Zero-discharge regime

At present, Canada has a zero-discharge regime in its internal waters, its territorial sea (12 miles) and its fishing zones (200 miles). When Canada accedes to MARPOL, as planned in 1991, tankers over 150 tonnes gross tonnage and other vessels over 400 tonnes gross tonnage will be permitted to discharge an oily mixture containing up to 15 parts per million of oil into the 12-mile territorial sea, if they are operating the monitoring equipment required by the convention. Tankers under way at least 50 miles offshore will be able to discharge oily mixtures at an instantaneous rate of 60 litres per mile.

Accession to MARPOL will not affect Canada's ability to protect the internal waters of the Arctic, the Great Lakes and the St. Lawrence River. For Canadian Arctic waters beyond our internal waters, Canada's accession to MARPOL will include a reservation which will permit the maintenance of zero-discharge standards appropriate to the unique nature of the Arctic. In the case of the Great Lakes and the St. Lawrence River, a zero-discharge regime appropriate to a system which provides millions of Canadians and Americans with drinking water should be maintained. Because the technology to measure concentrations of less than five parts per million is not readily available, we should accept up to five parts per million as a zero discharge. At this concentration, oil is invisible. Therefore, once oil is visible anywhere in Canada's internal waters, the limit has been exceeded and an offence has been committed.

Because vessels will not be permitted to discharge pollutants into our waters, it is essential that adequate reception facili-

ties for oil and chemical residues, garbage and sewage be made available at ports throughout the country.

Recommendation 5-6

Waste reception facilities be provided at all ports and harbours, and charges for their use be incorporated into the standard docking fee.

Uniform regime

To avoid confusion, some of the terminology used in the AWPPA and the CSA needs to be standardized. For instance, the CSA's "discharge" is, for the purposes of the AWPPA, a "deposit". What the CSA calls a "pollutant" is, for the AWPPA, "waste". The standardization should adopt the CSA's broader definition of a pollutant, including the ministerial authority to deem any substance to be a pollutant.

A provision should be prepared permitting the Governor in Council to establish regulations under the AWPPA prohibiting the carriage of specific pollutants in any quantity, similar to the provision contained in section 657(1)(c) of the CSA, regardless of whether the pollutant is carried as cargo or fuel.

Similarly, the powers of pollution prevention officers under the AWPPA should be enlarged and updated by making them similar to those in the recently amended CSA. (It is obvious to us that problems of inconsistency are not limited exclusively to these two Acts. Indeed, the degree of compatibility between all of the components of our maritime law framework needs to be reviewed and upgraded.)

Recommendation 5-7

The Canada Shipping Act *and the* Arctic Waters Pollution Prevention Act *be amended to minimize overlap or conflict.*

Duty to remedy

Although there are provisions in the *Fisheries Act*, the *Canadian Environmental Protection Act*, and the *Oil and Gas Production and Conservation Act* imposing a duty on the polluter to minimize damage and clean up a spill, there is no such provision in either the *Canada Shipping Act* or the *Arctic Waters Pollution Prevention Act*. These Acts should be amended accordingly.

Recommendation 5-8

The Canada Shipping Act *and the* Arctic Waters Pollution Prevention Act *be amended to impose a duty on polluters to report and to remedy.*

Shipping safety control zones

We are also concerned about the outer limit of Canada's shipping safety control zones in the Arctic, presently 100 miles from base lines. In order to fall in step with the usual 200-mile fishing zone limit and Law of the Sea Convention limit, these zones should be extended to 200 miles, except between Canada and Greenland where the outer limit would extend to the boundary between them.

Recommendation 5-9

Shipping safety control zones be extended to 200 miles from Arctic base lines.

Other issues

Aids to navigation

The Government of Canada maintains a system of navigational aids upon which mariners rely. It is therefore the Government's duty to ensure that these aids are in working order. At the hearings, we were asked whether or not Vessel Traffic Services were navigational aids for the purposes of section 677 of the *Canada Shipping Act*. Their status is at present unclear, but we believe they should be recognized as navigational aids under the Act. However, we realize that international convention remains silent on this issue.

Recommendation 5-10

The Canada Shipping Act *be amended to make it clear that Vessel Traffic Services are to be considered aids to navigation, and Canada's representatives in multilateral fora should make representations to have this recognized nationally.*

Joint and several liability

Under common law, where two or more individuals are held responsible for damages, they are deemed to be "jointly and severally liable". This means that the party suffering the damages is entitled to collect the full amount of damage from any one of the parties. Common law does not recognize the possibility of contribution between wrongdoers. Thus, a plaintiff could sue a party deemed to be only ten per cent at fault for the full amount of damages, and that defendant would have no right of recovery against the party ninety per cent to blame.

To rectify this, most provinces have enacted legislation providing for the apportionment of contributions among joint wrongdoers. The *Canada Shipping Act*, however, provides for joint contribution only in a limited range of cases. This should be remedied.

Recommendation 5-11

The Canada Shipping Act *be amended to specifically provide for contribution between parties jointly responsible for a spill.*

The Western Arctic (Inuvialuit) Claims Settlement Act

Another component of the legislative framework which needs to be reviewed is the *Western Arctic (Inuvialuit) Claims Settlement Act*. The Act states that its provisions would prevail over those of any other Act in respect of inconsistencies which might arise. It also sets out procedures according to which any development is screened, mitigative measures are recommended and maximum liabilities defined. Provisions governing liability and compensation are included, notably to cover economic losses due to diminished harvests of wildlife. These compensation provisions go well beyond those traditionally accepted internationally.

If shipping were included in the definition of "development", and thus captured under the Act's requirements, all contradictory provisions (including conventions) for liability and compensation for pollution damage would apparently be overridden. If this were the case, no insurance would be available to cover the wide range of compensation the Act requires. A legal opinion on these issues is currently being sought by the Department of Justice.

"We do not have, anywhere in Canada, a resource base adequate to handle an oil spill of the magnitude of the Exxon Valdez, nor could we handle a much smaller chemical spill."

Captain Peter Heathcote, Marine Atlantic

Chemical pollution

At present, there is no comprehensive statutory liability regime in respect of spills from chemical tankers.

The 1987 revision of the CSA implemented several codes developed by the IMO to prevent chemical pollution, but the point made in previous chapters bears repeating: even the safest of systems can fail. There is no way of guaranteeing that a significant spill of chemicals will never happen in Canadian waters.

Chemical spill response is complicated because, unlike oil, chemicals are not all substantially similar commodities with shared characteristics. Some chemicals sink, others float; some dissolve, others coagulate. Certain chemicals kill marine vegetation or cause it to grow excessively. Some are known to be deadly to human life in relatively small quantities. According to the U.S. Coast Guard, chemical spill clean-up may be five times as lengthy and ten times as costly as the clean-up of an equivalent volume of oil.

Discussions are now under way, under the auspices of the IMO, to develop a liability and compensation regime for chemical contamination from spills, explosions, fires, or other accidents. This regime is to be known as the Convention on Liability and Compensation for the Maritime Carriage of Hazardous and Noxious Substances. This is an important development and Canada should do everything possible to encourage its ratification.

Throughout our review, we advocated the "polluter pays" principle. This principle can be extended to the question of risk: those who create it should share in the cost of its mitigation.

In this report, we have also supported the establishment of regional spill response cooperatives, to be financed in part by the reimposition of levies under the SOPF. The resources available in these co-ops would be used to respond to spills of all kinds — including chemical spills. Equity thus dictates that Canada's $11.3 billion chemical industry should also contribute to the financing of the regional and national response capacity.

Determining an appropriate levy for the chemical industry which reflects the risk it poses is problematic. Some chemicals, while dangerous, soon evaporate, disperse, or are assimilated into the environment with little discernable effect. It would thus be unfair to impose an across-the-board levy on all shipborne chemical products. How then can this problem be solved?

As stated earlier, when Canada accedes to MARPOL in 1991, it will be adopting its compulsory second annex relating to bulk shipments of chemicals. (We have also recommended that Canada adopt MARPOL's third annex relating to chemicals in packaged form.) Under Appendix II of the second annex, named chemicals are listed by category, and the type of ship in which each category of bulk chemical is to be carried is defined. Herein lies the basis for the determination of an equitable levy for the chemical industry's contribution to the maintenance of regional spill response co-ops.

A levy should be imposed on all marine shipments of bulk chemicals falling under MARPOL-defined categories I and II. In setting the amount of this levy, consideration should be given to the fact that there are lower volumes of chemicals than of petroleum being shipped.

Recommendation 5-12

Canada impose a levy on the bulk movement by ship of all MARPOL-defined categories I and II chemicals as

part of the chemical industry's contribution to the maintenance of the regional and national response capacity. In setting this levy, consideration be given to the fact that there are lower volumes of chemicals than of petroleum being shipped.

Taking profit out of pollution

Rationalization of penalties

There are large discrepancies between the penalties imposed under various statutes for pollution by oil and chemical discharge. The *Canada Ports Corporation Act* and the *St. Lawrence Seaway Authority Act* both contain penalties for pollution. We have been told that there have been no convictions under the anti-pollution provisions of either Act. The maximum fine permissible under the *Canada Ports Corporation Act* is $500; under the *St. Lawrence Authority Seaway Act*, $1,000. This has not presented a practical problem, however, as both Acts deal with waters also covered by the *Canada Shipping Act*, which can be enforced by the Coast Guard. In light of this, the anti-pollution penalty provisions of both of these Acts should be deleted.

The other federal Acts addressing ship-source pollution provide for maximum fines ranging from $50,000 *(Fisheries Act)* to $1 million *(Canadian Environmental Protection Act)*. Certain Acts also provide for the jailing of culpable executives.

Under section 122 of the *Canadian Environmental Protection Act*, where a corporation commits an offence under the Act, any officer, director or agent of the corporation involved in the commission of the offence is equally subject to the penalties provided in the Act. We believe it is entirely justifiable to demand enhanced accountability, enforced with substantial penalties, for acts of pollution.

The *Fisheries Act* provides that if information volunteered by any individual leads to a conviction for a pollution-related offence, that person is entitled to a share of any fine levied. We think it appropriate to put such a "bounty" on polluters. To do so would underline the point that controlling pollution is indeed the responsibility of each and every Canadian, and would hopefully help to instill this principle as a national norm.

Recommendation 5-13

In order to deter deliberate and negligent acts of pollution:

- *maximum levels of fines provided under any Act of Parliament for acts of pollution be increased to the level of the* Canadian Environmental Protection Act;
- *there be provisions in these Acts for the jailing of culpable executives;*
- *persons reporting illegal acts of pollution should share in the proceeds of any fines levied, to a maximum of $25,000 per incident.*

Determination of fines

The amount of the fine to be levied against a polluter must be sufficiently large to deter pollution.

As things stand, a ship's master can choose between dumping oily wastes overboard and risking a relatively small fine or — at a cost to the owners of approximately $15,000 to $25,000 a day — delay the ship's arrival at its final destination by going to a discharge facility. More often than not, the clear choice has been dumping, because spills are seldom detected, vigourous prosecutions are uncommon and convictions are rare.

"It is surprising how few ships carry electronics technicians and spare parts."

Captain Angus McDonald, The Company of Master Mariners of Canada

Where a conviction is obtained, the amount of the fine is often much lower than the cost of delaying the vessel would have been. For example, although the maximum fine under the *Canada Shipping Act* is now $250,000, the few cases that have been prosecuted to conviction have resulted in very small fines, usually less than $10,000. A recent fine of $30,000 was considered a radical departure from the norm.

In addition, Protection and Indemnity Associations (P&I Clubs) will frequently pay the owner's fine as a matter of course. Professor Owen Lomas, in a 1989 *Journal of Environmental Law* (Vol. 1, No.1) article entitled "The Prosecution of Marine Oil Pollution Offences and the Practice of Insuring against Fines" writes:

> ". . . shipowners and their P&I Clubs are offering indemnities which should, in most cases, be held to be illegal, unenforceable and contrary to public policy, were they ever to be relied upon before the courts . . . "

Although it is unusual in most countries for underwriters to insure fines, P&I Clubs apparently continue to do this. Thus, even when a vessel is fined, the owner is reimbursed; therefore, the fine has no deterrent effect whatsoever. Clearly, fines must be large enough to deter the vessel owner or the P&I Club from subsidizing this activity. **A regime must be developed which takes the profit out of pollution.**

Our first inclination was simply to impose a minimum fine of $25,000, the approximate cost of delaying a large vessel for one day, and a mere 10 per cent of the current maximum fine. This, however, might result in an unreasonably high fine in some cases. Furthermore, judges should be free to impose minimal fines when circumstances justify it.

The penalty must be proportionate to the offence. We therefore are proposing the following guidelines for determining appropriate penalties for those convicted of offences against the environment:

1. The degree to which the pollution-causing incident was intentional, the result of negligence, or purely accidental should be taken into account.
2. The efforts made to mitigate the damage that resulted should be taken into account.
3. It should be determined whether the fine will be paid by an insurer or otherwise reimbursed.
4. The fine should eliminate any profit that may have been made by the offender through the act of polluting.
5. The fine should be a multiple of the cost of the time saved.
6. The fine should be a multiple of the damage caused.
7. The fine should be increased for second, and subsequent, offences.
8. The maximum fine provided by Parliament should be recognized as appropriate for serious cases of oil or chemical pollution.
9. A jail term should be imposed whenever an intentional act of pumping or repeated offences can be traced to a director, an officer, an agent, a master or a crew member.

The *Fisheries Act* provides a good case in point of the applicability of such guidelines. Section 41(2) of the Act permits the Court a certain amount of creativity in determining penalties. Specifically, the judge is empowered to fash-

ion a sentence which "will or is likely to prevent the commission of a further offence".

In December 1989, a judge of the Territorial Court of the Northwest Territories used this section to order the directors and the chief executive officer of a company convicted under the *Fisheries Act*, in connection with a discharge of fuel oil, to publish a signed apology for the company's behaviour. The apology, which was in addition to a $15,000 fine, was to include photographs of the officials, along with an undertaking to pay directly any claims for economic losses caused by the spill.

Recommendation 5-14

Acts of Parliament be amended to include a provision similar to that found in section 41 of the Fisheries Act *to give judges the authority to fashion sentences appropriate to the offences.*

Compensation for pollution damage

The '69 CLC provides that a shipowner will be liable for oil pollution damage, including any reasonable preventive measures " . . . taken *by any person* after an incident occurred . . . " The '71 Fund Convention accepted the same definition of "pollution damage" and "preventive measures".

On the other hand, the CSA provides that the shipowner will be liable for oil pollution damage, and for the costs and expenses incurred by a *public authority* in Canada or in another state which is a party to the CLC, with respect to measures taken to prevent, repair, remedy or minimize oil pollution damage insofar as those measures are reasonable. In other words, under the CSA the shipowner is *not* liable for " . . . any reasonable measures taken *by any persons* . . . "

The general principle of law in Canada is that volunteers are not entitled to be rewarded for their services. They may decline to provide their services, but if they do volunteer their services, they are liable for any negligence in the performance of those services, and are not entitled to be paid. To remedy this situation, "Good Samaritan" Acts, that generally protect volunteers from suit, have been passed in a number of jurisdictions. We are of the view that oil pollution is certainly an area in which members of the public should be encouraged to take initial action, and to continue so long as they are rendering useful services. They should be reimbursed for the costs of any reasonable preventive measures they take and be protected from suit in the event they cause further damage.

The International Fund only indemnifies persons to whom the shipowner is liable. If the shipowner is not liable for a claim under Canadian law, the Fund need not pay that claim. Thus, by narrowing the definition of the persons to whom shipowners are liable, the CSA may have taken away the right of the claimant to recover from the International Fund.

Recommendation 5-15

The Canada Shipping Act *be amended to make shipowners responsible for any reasonable measures taken by any person to prevent, minimize or clean up the damage, and "Good Samaritans" be protected from suit in the event their well-intentioned actions cause further damage.*

As explained previously, compensation for pollution damage resulting from oil spills is governed internationally by the '69 CLC and the '71 Fund Convention. Both of these conventions contain a very broad definition of "pollution damage". This has left the governing body

"As it is now, because of the bureaucratic Canadian and international red tape, a young man could die of old age before a compensation claim was settled."

Earl Johnson,
Come By Chance Area Regional Fishermen's Committee

"The Canada Shipping Act should be amended to require the shipowner and industry to pay for all practical measures to fully restore the environment to its former state, and there should be full compensation for all environmental damage, including non-economic damage."

Calvin Sandborn,
West Coast Environmental Law Association

of the International Fund, the Assembly, and its Executive Committee free to develop principles for payment on a practical basis as accidents occur and settlements are made. To determine what is considered to be included in the definition, one must look at the court cases and settlements in which the International Fund has been involved.

The '69 CLC states that "pollution damage" means "loss or damage . . . caused by . . . contamination . . . " As previously mentioned, the '71 Fund Convention accepted this definition. Claims for clean-up costs and damage to property have been readily accepted by the Executive Committee, but its treatment of claims for economic loss has been less consistent. Claims for loss of earnings by persons who have suffered property damage are usually paid. However, where no property damage has been suffered, this is not always so. In some cases, the Executive Committee has agreed to pay claims for lost wages and other economic loss to special classes of persons (fishermen, hotel and restaurant owners and others who depend on seashore-related activities); in others, claims for loss of earnings have not been paid.

The 1989 amendments to the CSA have given fishermen, workers in certain types of fish processing plants, sport fishing boat operators and charter operators, among others, a right of action for loss of income. The general rule in Canada, in most circumstances, is still that individuals cannot recover for economic loss unless they have also suffered physical loss, or damage to their person or property.

The most serious problem arises with respect to compensation for damage to the environment. Here we are talking about damage to fish, mammals, shellfish, birds, and other forms of wildlife, as well as to the aesthetic value of seashores, lakes or river banks. The Assembly of the International Fund has taken the position that compensation for environmental damage will only be made for quantifiable economic loss suffered by a person who has a right to claim under the national law of his or her state.

In Canada, at the moment, the only possible recourse is an action for a public nuisance, but such an action can only be brought by the Attorney General, a person with the consent of the Attorney General, or a person who has suffered some harm or has some interest which differs from that of the general public. Without this separate and distinct interest, an individual has no "standing" in law to bring the action.

If and when the 1984 Protocols to the '69 CLC and the '71 Fund Convention come into effect, the earlier definition of "pollution damage" will be changed by adding: " . . . provided that compensation for impairment of the environment other than loss of profit from such impairment shall be limited to costs of reasonable measures of reinstatement actually undertaken or to be undertaken". Presumably, the loss of profit, which by inference will be allowed by this addition, will be the narrow loss suffered by persons engaged in seashore-related activities. What is more significant, is that only the costs of reinstating environmental damage will be compensated, and not the damage which cannot be reinstated or restored.

It is interesting to note that the 1989 Salvage Convention has a much broader definition of "environmental damage" which, because of its importance, we set out in full:

"(d) Damage to the environment means substantial physical damage to human health or to marine life or re-

sources in coastal or inland waters or areas adjacent thereto, caused by pollution, contamination, fire, explosion or similar major incidents."

True, this is simply a description of the damage which salvors and shipowners must exercise due care to avoid, and not a description of damage for which there is compensation. Nevertheless, it recognizes that what is mentioned needs to be protected. This is a far more advanced definition of "environmental damage" than the negative definition of the International Fund referred to in the previous paragraph.

Shipowners, government agencies, the oil industry and others in Canada have continued to consider clean-up costs and damage to property without giving any thought to compensation for social, economic or environmental damage. At the public hearings, many participants stressed their concern about this approach. It may be too simple a view, but the public clearly does not want tankers coming to our shores and causing environmental damage. If such damage does occur, the public wants compensation, not by way of retribution, but to assist in protecting, preserving or enhancing the environment in some other way.

In its brief, the West Coast Environmental Law Association suggested that shipowners and industry should be obliged to pay for all practical measures to fully restore the environment to its former state and for full compensation for all environmental damage, including non-economic damage. In addition, if restoration is impossible, the non-restorable damage to the environment should be quantified, and compensation paid to institutes dedicated to preventing spills and enhancing the marine environment.

We believe that the International Fund is now moving towards paying any reasonable cost of restoring resources, such as shellfish, to their former state. This is reflected in the limitation on compensation for impairment of the environment contained in the 1984 Protocols to the '69 CLC and the '71 Fund Convention referred to above. It is also reflected in the settlements made by the International Fund.

Of even more significance is the fact that the *Canadian Environmental Protection Act* empowers a court, upon the conviction of offenders under the Act, to make an order directing the offenders to remedy any harm to the environment that has resulted, or may result, from their actions. We think that similar provisions should be included in the *Canada Shipping Act*.

The more difficult problems are how to recover compensation for non-restorable damage, how that damage should be quantified, and to whom the damages, once awarded, should be paid.

In its 1989 report on "Standing" the Ontario Law Reform Commission recommended that for environmental damage " . . . any person should be entitled to commence and maintain a proceeding unless the court is satisfied that the factors against proceeding outweigh the factors in favour of proceeding", whether or not that person has any proprietary interest. In its most recent, and extremely helpful, report released in 1990 *(Report on Damages for Environmental Harm)*, the Commission recommends "the creation of a new civil statutory remedy, an award of damages payable to compensate the public for harm done to the environment, entirely independent of any damages payable for injury caused to individuals or corporations". We endorse this concept.

"The record of the shipping industry in marine pollution has greatly improved, but there is certainly room for further improvements."

Edgar Gold,
Canadian Maritime Law Association

The reasons which prompted the Ontario Law Reform Commission to produce this report are forcefully stated in the document. We consider the following extracts persuasive:

"As a matter of first principle, we accept that, simply as an attribute of membership in the community, an individual may be entitled to bring civil proceedings to address a general or public harm . . . "

" . . . individuals may have a legitimate stake in taking action responsive to this harm, even though not directly affected."

" . . . private enforcement is a feature of our present legislative landscape . . . "

" . . . creation of a civil damages remedy can be supported on an economic basis as tending to promote the most efficient allocation of resources."

For a further discussion of the need for, and the nature of, the proposed civil damages remedy, we simply refer readers to the Commission's report. On the other hand, it may be enlightening to list the various headings under which the report proposes that environmental damage be assessed. There are definite reservations with respect to all of them, except restoration and replacement costs, but used individually, or collectively, they are a starting point for this relatively unexplored area. The headings are:

- **Market Valuation**
  using the existing free market to determine the value of a resource;
- **Restoration and Replacement Costs**
  restoring the environment to its pre-contaminated state;
- **Contingent Valuation**
  conducting personal and telephone interviews, and mail surveys to ask people what monetary value they place on non-market commodities;
- **Travel Cost Valuation**
  assumes the cost of travelling to a resource is tantamount to the value of the natural resource;
- **The Hedonic Price Method**
  calculates the degree to which the value of a non-marketed good, such as a pristine environment, is reflected in the price of a marketed good, such as land.

Again, assuming that an action is brought by an individual for environmental damage and an award is made, the question arises as to whom the monies should be paid and for what public purpose. The Law Reform Commission of British Columbia in its *Report on Civil Litigation in the Public Interest* recommended that damages received on behalf of the public should be paid to the Attorney General. The Ontario Law Reform Commission report recommends that a special government body administer the awards. We believe the latter might be preferable in our subject area because it could build up expertise in restoration of the marine environment as a first priority, which could not be expected of the Ministry of the Attorney General.

Compensation awarded under the heading of Restoration and Replacement Costs would be spent for that purpose. It is more difficult to define how compensation awarded under the other headings should be spent, and it is not necessary for us to do so. The main attraction for us is the concept of a new civil action for environmental damage to be brought by a member of the public.

In the course of the hearings, it became obvious to us that government officials, who see spills often and know that in most cases they will disappear on their own and that nature will eventually repair much of the damage, have a very different sense of hurt than the person who for the first time sees the horror of oil on a beach, the shore of a lake, or a river bank. Whether or not there is permanent damage, officials eventually move on to the next spill; residents are left with the damage.

The concept of a member of the public having the right to commence a civil action for environmental damage is entirely consistent with our view that the public must become more involved in observing and reporting spills, and that local and municipal agencies must play a greater role in the initial clean-up response. However, the privilege of bringing a private action is one which could easily be abused by overzealous persons. It would therefore have to have special safeguards such as requiring the court to review and, if appropriate, dismiss unworthy claims at an early date, or award punitive costs after trial if the action should not have been brought. Nevertheless, it is up to the public to make government and industry sensitive to the need to protect the environment on all fronts.

The public deserves to be the watchdog of environmental damage and to have the right to take action in circumstances when the government is understandably far too occupied with more urgent matters.

The only question remaining is how this action should be implemented. Earlier in this chapter, we dealt with both the issue of a class action and our proposal to include a "Good Samaritan" clause. These measures, however, are directed towards facilitating recovery against the International Fund and, failing full recovery from that source, the SOPF.

The action that we are now discussing would in effect be a right of action in negligence against the polluter. Nevertheless, we think that our purposes would be served by an amendment to the *Canada Shipping Act* giving a "Good Samaritan" the right to bring an action, or a number of "Good Samaritans" the right to bring a class action, for "environmental damage", which would be defined to include all reasonable measures to restore the environment to its former state, as well as full compensation for non-restorable environmental damage, and not be limited to economic damage. Individuals would be entitled to sue without having any personal, proprietary, or special interest themselves.

Recommendation 5-16

The Canada Shipping Act *be amended to give private citizens the right to commence a civil action for the benefit of the public for environmental damage caused by oil or chemical spills. Moreover, the definition of "environmental damage" to be set out in this amendment to the Act include all types of loss, damage or harm currently embraced in that term in its usual, ordinary meaning.*

We recognize that this recommendation may prove to be troublesome in an international context. However, we will have to leave it up to those who negotiate so effectively on behalf of Canada in the international forum to resolve any problems that may arise.

1. All references to miles in this chapter refer to nautical miles.

Chapter six

Regional issues and recommendations

Introduction

As we toured the country, listening to over two hundred groups and individuals, we were struck by the diversity of the regional issues. This stems as much from the nature of the country as from the nature of the problem.

While many issues, such as training and contingency planning, are common to all the regions we reviewed, the characteristics of oil spills, and the response and clean-up requirements, vary from region to region. Local circumstances, equipment availability, the type of water the spill occurs in (salt or fresh), the nature of local fish stocks and the potential impact on wildlife — all these factors influence response and cleanup operations.

In this chapter, we first outline what were reported to us to be the special features of each of the six regions we reviewed. We then examine the vessel traffic and the recent spills in the area, and offer highlights of the public hearings that were held. Lastly, we make recommendations that, although not meant to be all-inclusive, reflect critical regional issues brought to our attention and, in our view, warrant action. The chapter begins with Newfoundland and Labrador, moving westward through the Maritimes and the St. Lawrence River to the Great Lakes, then north to the Arctic, and ending up with the West Coast, the region on which we were requested to focus.

Newfoundland and Labrador

Special features of the region

The coastal features of Newfoundland and Labrador as they appear today were formed 12 000 years ago when glacier ice receded to the north, leaving the 17 000-kilometre coastline punctuated by deep fjords, rugged shores and majestic bluffs.

Extending into the North Atlantic, Newfoundland's shoreline is battered by hurricane-force winds, crashing seas and unrelenting ice. On the east coast of the island, the seabed is scoured by enormous mountains of ice, to depths up to 12 metres.

The ocean off the Newfoundland and Labrador coast lies in the southwest quadrant of the Icelandic low pressure area and to the north of the mid-Atlantic high pressure system near the Azores. As a result, there is a 15 per cent chance of full gales and storms in the cold months, a traverse of intense extra-tropical depressions from July to October and prolonged fog in the summer.

Southeast of Newfoundland, in the path of the Labrador Current, with the Gulf Stream to the south, lie the Grand Banks, one of the richest fishing grounds in the world. When the cold Labrador current converges with the warm Gulf Stream, prolonged periods of fog result. Ice appears in the Labrador Sea in November and the full thrust of this ice over the Banks does not recede until March. Between 200 to 2000 icebergs calved in Greenland cross this area each year through midsummer (one year the numbers reached 2100). Add to this frequent hurricane-force storms, and the area quickly becomes treacherous to mariners.

Such harsh climatic conditions make the northeast coast the most treacherous of all navigated seas in Canada. It demands well-found ships, competent navigation, and experienced and well-trained captains, officers and crew. Still, even with today's advanced technology, severe weather and storms can wreak havoc and render experts helpless.

Despite the severe climate, there is an abundance of fish, mammals and seabirds in the region. Along the coast of Newfoundland and Labrador there are many seabird colonies, so a spill in proximity to such an area could have a catastrophic effect on an entire species.

Five seabird ecological reserves have been designated under the *Wilderness and Ecological Reserves Act, 1980*. These provide breeding grounds for over 90 per cent of all the seabirds in eastern Canada. Cape St. Mary's Seabird Reserve is of particular concern because of its importance for both breeding and wintering seabirds. In winter, it provides critical habitat for sea ducks and supports the largest-known Newfoundland population (and one of the largest in eastern North America) of the harlequin duck. In April 1990 the harlequin duck was placed on the endangered species list for eastern North America; there are less than 650 of them in the area.

Newfoundland and Labrador have the largest Atlantic puffin, common murre and razor-billed auk colonies in North America, the second-largest northern gannet colony in North America, and

"We put a lot of energy initially into our maritime legislation. Somehow we have lost our impetus, and the result can only be less safety at sea and greater maritime pollution."

Leslie O'Reilly,
Newfoundland and Labrador Institute of Fisheries and Marine Technology

the largest and second-largest Leach's storm-petrel colonies in the world. More than 30 species of migratory seabirds breed in the region. During the summer, 5 million shearwaters, 10 million Leach's storm-petrels, 420 000 puffins, 25 000 gannets, and 115 000 kittiwakes nest in the area. In the winter, up to 24 million dovekies and 5 to 6 million thick-billed murres from Greenland and the Arctic join millions of other seabirds on the Grand Banks, as well in the coastal waters around eastern Newfoundland and Labrador.

The waters around Newfoundland and Labrador contain more than 200 species of fish, including 17 species of ground fish and 12 species of pelagic fish, as well as 8 species of mollusc and crustaceans. The region also has six species of seals, with world-dominating populations of the harp and hood seal, and remnant populations of the walrus. Twenty-five species of cetaceans constitute one of the world's most diverse whale populations, which includes blue, North American right, humpback, Sowerdys and bowhead whales. Their numbers, however, are seriously threatened and on the decline.

With such high concentrations of the world seabird and seal population, an abundance of rich fishing grounds and the presence of many threatened whale species, the region is extremely sensitive to spills. Spawning grounds — especially those in Placentia Bay — are particularly vulnerable, as are shellfish beds, which are extremely susceptible to oil tainting. The tainting of any species, whether actual or perceived, can adversely affect the marketing of all fish products in the province.

Much of the history of Newfoundland and Labrador has been shaped by economic factors related to the marine environment. The fishery has sustained the Newfoundland economy for hundreds of years and much of the population living outside town centres is almost entirely dependent upon the sea. In 1988, 11 190 full-time and 12 189 part-time fishermen took 483 064 tonnes of fish, worth more than $245 million from Newfoundland waters. Thousands of fish plant workers, support staff and spin-off businesses also rely on the fisheries.

The native population and Labradoreans also depend upon the bounty of the sea for their economic and cultural well-being. By late December land-fast sea ice has formed in Northern Labrador, extending from the bays and inlets out to the seaward islands. The frozen sea, snow-covered land and ice-covered lakes and rivers provide Inuit hunters access to extensive land and offshore areas of Labrador, where they hunt and fish in the fall and spring for their livelihood. The health of the Labrador Sea remains therefore vital to the communities of the area.

In the eighties, offshore oil exploration on the Grand Banks offered the possibility of reducing Newfoundland's dependence on the fishery. Over the past three years, however, exploration drilling has tailed off and the decision to go ahead with full-scale production rests in the hands of Mobil Oil and the federal and provincial governments.

Tourism is also becoming increasingly important to Newfoundland. Revenues have risen significantly, from $239 million in 1984 to $382 million in 1989, and this can be credited in part to marine wildlife tourism. Seabirds and whales — the most prominent and popular groups of marine wildlife — are in great need of protection, because they are the most threatened by, and vulnerable to, the effects of oil spills.

Major Tanker Routes and Environmentally Sensitive Areas: Newfoundland and Labrador

Legend

- Environmentally sensitive areas*
- Major tanker routes

*Includes coastal and marine parks, wildlife sanctuaries and conservation areas

Vessel traffic

In 1988, 39 053 vessels reported into Newfoundland's traffic centres. The island holds a strategic position relative to North Atlantic shipping lanes, through which pass tanker shipments from Europe, Africa, the Middle East, the North Sea, the Caribbean and the Arctic. Some of these are directed into Placentia Bay, on the south coast, where oil is refined at Come By Chance. Over 30 million tonnes of crude oil and refined products were shipped into Come By Chance and other eastern Canadian ports in 1988. Of that, 3.5 million tonnes of crude from Africa and the North Sea were refined at Come By Chance and eventually shipped to the United States. This represents more than 60 per cent of the movement of petroleum products in the region. Small volumes of fuel are also shipped along the Labrador coast during the summer months to supply Labrador and eastern Arctic communities and bases.

Pilotage Zones in Canada: Newfoundland and Labrador

Legend

Compulsory pilotage zones

Placentia Bay is considered by many to be the most likely place in Canada for a major spill. It has more than 365 islands and reefs and is subject to visibility of less than one kilometre an average of 187 days per year. In August of 1987, the oil refinery was reopened in Come By Chance, increasing tanker traffic and the risk of accidents. The following year, more than 374 transits were made by tankers to and from the refinery. The inner reaches of the Bay, where the refinery is located, are narrow and local knowledge is a distinct benefit to navigation. A major spill could destroy the local fishery and the livelihood of thousands of people. Over 2500 full-time and part-time fishermen make their living from the Bay's marine resources. A productive commercial industry processes cod, flounder, salmon, capelin, herring, mackerel, squid, crab, lobster, scallops and lumpfish. In addition, several underutilized species, such as whelks, sea urchins and dogfish, are found in the Bay.

From early winter to midsummer, ice and icebergs are prevalent in the Labrador Sea and the Strait of Belle Isle, making navigation risky. Tankers therefore avoid the area, in favour of the shipping lanes south of Newfoundland. The Grand Banks, however, are also affected by migrating ice and icebergs.

The increased traffic on the south coast during this period also increases the frequency of chronic spills. These illegal releases of oil occur when ships pump ballast water or oily wash-water waste from their bilges. Once on the water, the oil becomes a threat to both seabirds and sea mammals. Because the ships responsible for such spills are rarely in the vicinity by the time dead birds or mammals are discovered, these are referred to as "mystery spills". Indeed, the waters around Newfoundland are becoming so polluted by chronic oiling that some Newfoundlanders refer to them as "the cesspool of the Atlantic". The cumulative effects of these discharges are unknown at this time, but it is apparent that they could cause untold damage to the fisheries, the seabird populations and the coastline.

Recent spills

I. Ship operations

Three operational spills were reported in the region in the last two years:

- **March 1988**
  Liberian tanker *South Angela* spilled 79.5 tonnes while offloading at Come By Chance. Bond posted to cover claims; minimal tainting/ damage.

- **January 1989**
  Northern Dancer was charged but acquitted of discharging oil into Placentia Bay.

- **Winter 1989-90**
  "Mystery spills" killed an estimated 18 000 seabirds in Placentia Bay and surrounding areas.

"The seafood industry is the most vulnerable sector to pollution in any form and initially the greatest damage is the destruction of the image of 'fish from the icy cold (and clean) waters of the Northwest Atlantic'."

Richard Moores,
Fisheries Products International

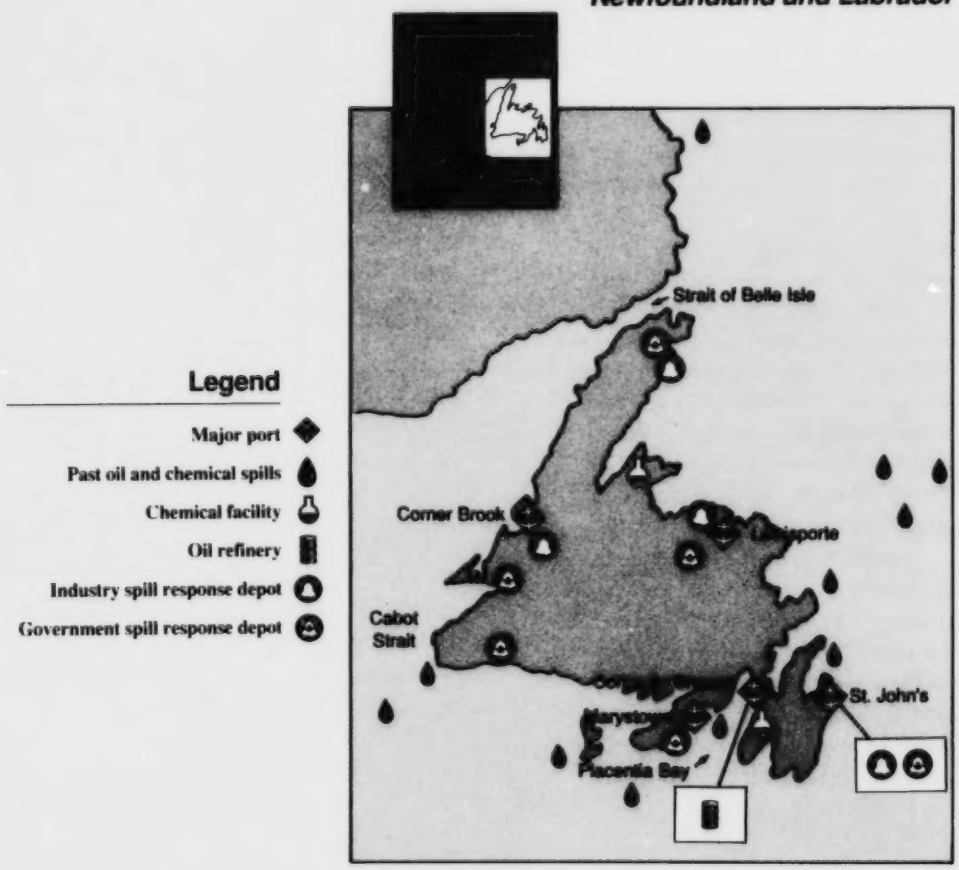
II. Marine accidents

- **March 1979**
  The *Kurdistan* broke up in Cabot Strait, losing 7000 tonnes of oil, some of which came ashore in Newfoundland, fouling the beaches and causing considerable damage to the seabird population.

Although the number of spills due to accidents is low, there have been several potentially dangerous occurrences:

- **March 1988**
  The *Filia Star* grounded on a Red Island shoal in Placentia Bay; no penetration of hull.
- **May 1989**
  A foreign vessel was found proceeding to Come By Chance refinery with neither radar nor charts of Placentia Bay.

Oil and Chemical Spills and Response Depots: Newfoundland and Labrador



The hearings

Three days of hearings were held in Newfoundland: August 22 and 23 in St. John's and August 24 in Come By Chance. This gave 20 groups and individuals the opportunity to make written and/or oral submissions — 14 in St. John's and 6 in Come By Chance. A representative of the Labrador Inuit Association travelled from northern Labrador to make a submission at the Halifax hearings in October.

The main concerns raised at the hearings were: the safety of Placentia Bay, with respect to the volume of tanker traffic and spill response measures; the protection of Newfoundland and Labrador's resources; the impact of offshore development on the environment; and the lack of consideration for Labrador's special problems.

The Canadian Coast Guard presented a brief on its responsibilities in the region, detailing prevention programs and response capabilities.

A number of groups assessed the vessel traffic centre in Placentia Bay. Concern was expressed about its ability to monitor the Bay, given the antiquity of the equipment, the number of radar stations, and the coverage. Many felt that the station in Cuslett should be equipped with a radar system designed to provide maximum possible range, given the existing site and technical limitations. This system would be able to pick up vessels on the opposite side of the Bay, as well as those traversing south, within the 12-mile territorial waters.

The Nautical Institute suggested that an ocean-going tug should be provided for service in the Newfoundland region. This powerful vessel would perform several tasks, including assisting supertankers in distress on the high seas as well as in the vicinity of Placentia Bay.

Environment Canada expressed a need for a facility to train people in spill response measures. This would ensure a certain level of consistency that could be relied upon in the event of a spill. The Department also stated that polluters should be responsible for the cost of re-establishing breeding populations of species significantly affected by a spill.

The region's archaeological sites were also discussed at the hearings. There are many significant archaeological sites along the coast of Newfoundland and Labrador, representing 5000 years of Indian, palaeo-Eskimo and settler occupation. Some are situated on or near the existing shore; others, as in the case of the Red Bay Basque whaling vessels, at the bottom of harbours. In the event of an oil spill, the clean-up response could destroy a potential archaeological site.

The Labrador Inuit Association expressed particular concern about the threat to the Labrador environment and the "regulatory chaos" that characterizes the current regimes in place in the Labrador Sea. The *Arctic Waters Pollution Prevention Act* only applies to the region north of the 60th parallel. However, Arctic conditions are also prevalent in the Labrador Sea south of this line, an area covered by the *Canada Shipping Act*.

"The Labrador Inuit are sea people who depend on the resources of the Labrador Sea for our survival. When we say that, we do not only mean that we depend on the foods that we get from the Labrador Sea itself, we also mean that the Labrador Sea is a vital link for us as a means of transportation, to get through the coastal regions [and] the outer islands, and so it is used very much as a highway."

Sharon Edmunds,
Labrador Inuit Association

Other issues raised include hydrographic charting in the Labrador Sea. The rate at which it is being carried out is only 15 per cent of what it should be, according to modern standards. This increases concern over vessel traffic in the area. Also of concern is the response time to initiate clean-up, given that all the equipment is based in St. John's, and the lack of technology to cope with the recovery of oil trapped in pack ice.

In addition to the hearings, a number of groups participated in a "chronic spills" workshop that we sponsored in St. John's in October 1989, increasing awareness of the problem and discussing means to counteract chronic oiling.

"Some of the most frustrating types of spills . . . relatively small oil releases that occur in our marine environment . . . they are so often left to come ashore and impact upon the wildlife in these areas without being able to find the source, without being able to assess the responsible party for the pollution."

Gordon Pelly, Environment Canada

Recommendations

I. Vessel traffic control

Newfoundland and Labrador are located in a strategic area in relation to North Atlantic shipping lanes. Heavy tanker traffic in this area of prolonged periods of fog, extensive ice and icebergs, and extremely hazardous weather systems underscores the importance of state-of-the-art navigational aids and controls.

Placentia Bay is of particular concern. As noted above, it has visibility of less than one kilometre an average of 187 days per year, due to fog and snow squalls, and from December to April winter storms create havoc for navigation. The area is covered by two radar sites — at Argentia and Arnold's Cove — both with a 77-kilometre range. They operate on a bright display system, which limits land mass outline, and their resolution is affected by rain and high seas, resulting in sea clutter on the screen within 24 kilometres. The existing equipment is outdated and, given the volume of traffic, the environmental conditions, and the area's size and extreme sensitivity, it should be replaced.

Electronic charts, incorporating precise navigation capability, would greatly enhance navigation safety in Placentia Bay. The system should include technology for vessel identification.

Notices to mariners identify tanker traffic routing for Placentia Bay, the Cabot Strait and the Strait of Belle Isle. *These are only recommended routes and are not mandatory.* Inbound and outbound separation zones should be strictly adhered to, in order to prevent vessels from straying onto fishing grounds, damaging gear and possibly colliding with smaller fishing vessels or running aground on one of the hundreds of reefs in Placentia Bay.

Recommendation 6-1

To reduce the risk of major spills caused by collisions and groundings, Vessel Traffic Services be upgraded by:

- *installing a third radar system, with the capacity to track small vessels, at Cuslett, Placentia Bay;*
- *installing state-of-the-art radar equipment and plotting methods in Placentia Bay;*
- *making all marine traffic separation schemes for the Newfoundland region mandatory;*
- *initiating a study to determine the feasibility of providing a VTS (Vessel Traffic Services) centre for the Strait of Belle Isle.*

II. Pilotage

Reefs, rocks and shoals make the waters of Placentia Bay extremely hazardous, especially at the head of the Bay.

At present, all tankers greater than 223 metres, or any tanker on its first voyage to the Come By Chance refinery, must pick up a pilot near Argentia (close to VTS Zone CIP [call-in point] #6). Smaller ships, and those that have made previous voyages to the Bay, may proceed further to pick up a pilot at Coomb's Rock, near Arnold's Cove (CIP #9).

Recommendation 6-2

To reduce the risk of grounding or collision, all tankers should pick up a pilot near Argentia (CIP #6), approximately half-way into Placentia Bay.

III. Tugs

More than 236 tankers have navigated the reefs and islands of Placentia Bay since the reopening of the Come By Chance refinery, transporting a total of 12.9 million tonnes of crude and refined products.

Many ships entering Placentia Bay are single-screw vessels. If a malfunction occurs in the system, there is no back-up and the vessel is rendered immobile. Until such time as the problem can be found and rectified, it has no means of manoeuvring and is at the mercy of the tides, currents and winds. In the Bay, a vessel need not drift far to run aground, and the closest vessel which could be of assistance may be located as far away as Sydney or Halifax. The Come By Chance refinery has three 2800-horsepower tugs and one lineboat on permanent attendance at the dock, but the tugs have neither sufficient power to assist a stricken vessel nor the speed to arrive at the area in time to escort it to safe waters.

Recommendation 6-3

To reduce the risk of a major spill, an ocean-going, ice-strengthened tug or offshore support vessel, with the capacity to carry a full range of ocean recovery and containment systems, be based at Placentia Bay. It should be used to escort tankers between the entrance of Placentia Bay and the Come By Chance refinery, as well as to assist stricken vessels in the Bay, Cabot Strait and the Gulf of St. Lawrence.

IV. Reception facilities

The south coast of Newfoundland has a high incidence of chronic spills each year. It is suspected that they result from operational discharges by vessels in the transatlantic shipping lanes south of the island, many of them bound for ports on the east coast of the United States, as well as Canadian ports.

Recommendation 6-4

In order to minimize chronic spills, adequate vessel waste reception facilities be established at all major ports, with first and immediate priority given to Come By Chance.

V. Aerial surveillance

Nowhere in Canada is there a more pressing need for aerial surveillance than on the coast of Newfoundland.

More oil enters the ocean each year from ship operations and bilge pumping than from tanker accidents. This illegal dumping has been oiling beaches and killing thousands of seabirds each year in Newfoundland, due to the island's proximity to transatlantic shipping lanes. Without proper enforcement these actions will continue.

"Put crudely, oil, feathers and fish don't mix."

David Snow,
Wildland Tours

In the seventies and early eighties, Canada led the world in developing the technology required to detect oil spills from aircraft. However, unlike other nations, it has never applied this technology. Norway, Denmark, Great Britain and India, among others, operate dedicated aircraft for marine oil spill surveillance. Such an operation deters excessive and illegal discharge.

As a result of public concern when an estimated 18 000 seabirds were killed in the winter of 1989-90, the Canadian Coast Guard diverted the DC-3 usually assigned to the Great Lakes to survey the area. The origin of the spill that killed the birds could not be found, but, in the one-week period of surveillance, the aircraft spotted three foreign-flag vessels violating Canada's pollution regulations by discharging oil. Charges have been laid against one vessel and the authorities in the country concerned have been notified.

These results present undeniable evidence of the effectiveness and the need for aerial surveillance along the coast of Newfoundland to detect, prosecute and ultimately deter polluters.

Recommendation 6-5

To deter illegal pumping of routine tank washings and oily bilge water, there be regular aerial surveillance of the waters off Newfoundland.

VI. Clean-up and containment equipment

The Canadian Coast Guard Marine Emergency Depot at St. John's, Newfoundland has more than $15 million worth of clean-up and containment equipment for spill response on the east coast and in the Arctic. The inventory includes an emergency tanker offloading package with high-capacity submersible pumps and a portable inert gas generator; containment equipment (fence and Vikoma booms); recovery equipment (weir, rotating-disc and belt skimmers); combustion equipment (heli-torch and portable incinerators); dispersant spraying equipment; and a variety of support equipment, including barges, boats, pumps and hoses. Placentia Bay also has a depot, but most of the equipment it contains is not suitable for offshore spills.

The Coast Guard stated that it did not consider it practical to deploy booms and skimmers in open waters. Instead, the main purpose of booms would be to protect harbour entrances, sensitive fishing areas and beaches, and to retain oil in coves or in the upper reaches of bays. Research is ongoing in Europe to develop clean-up equipment for application in open seas.

Recommendation 6-6

To ensure an effective and immediate response capability:

- *state-of-the-art offshore equipment, including booms and high-capacity pumps and skimmers, be purchased, and existing equipment not suitable for the region should be relocated to areas where it can beeffectively used;*
- *foreign research and development of open-water containment and clean-up equipment, and retrieval techniques in ice, be followed closely and systems suited to Newfoundland's climate purchased when proven to be effective.*

VII. Environmental atlas

As previously noted, the waters around Newfoundland and Labrador are the wintering home of millions of seabirds. The area contains some of the most spectacular bird colonies in the world, as well as some of the world's richest offshore and inshore fishing grounds, and a high concentration of shellfish. Archaeological sites abound on the coast and islands, and at the bottom of harbours. An oil spill in the proximity of any of these areas could cause irreparable damage.

Recommendation 6-7

To improve spill response capability, a computer data base be established, specifying ecologically sensitive areas and the seasonal vulnerability of various physical, biological or cultural resources. Extensive studies must be initiated to gather pertinent oceanographic data around Newfoundland and especially in the Labrador Sea, about which little is currently known.

VIII. Education and training

Most Newfoundlanders are seafaring people, yet they have little general knowledge of the vulnerability of the province's environment.

Recommendation 6-8

To increase public awareness and improve preparedness:

- *efforts be made to instill a positive and healthy attitude in the youth of the province through the school system;*
- *local fishermen be informed of regulations concerning oil pollution and be encouraged to report spill sightings;*
- *a marine spill response exercise be held in Placentia Bay each year;*
- *training workshops on the capture, care and cleaning of oiled seabirds be held periodically in high-risk areas.*

IX. Shuttle tankers from offshore oil production

Following Mobil's discovery of oil at Hibernia in 1979, the prospect of oil field development off the coast of Newfoundland has become a reality. The project proposes to extract oil and gas from the Hibernia field using a gravity-based structure as a production platform. The oil produced would be loaded from the site onto shuttle tankers from a single-point mooring buoy, to be shipped to one of five potential delivery points: Quebec City; Dartmouth, Nova Scotia; Saint John, New Brunswick; Portland, Maine; or Come By Chance.

Mobil proposes to use three shuttle tankers, each with a cargo capacity of 120 000 dead-weight tonnes. They would have double, ice-strengthened hulls; segregated ballasts; twin-shaft propulsion and equipment for offshore mooring and loading. We would like to highlight and applaud Mobil's support for double-hull and dual-propulsion systems.

Although Mobil Oil believes that its tanker traffic would not significantly increase the risk of spills, the Hibernia Environmental Assessment Review Panel concluded that, even with specially designed tankers, the risk of oil spills would increase. The tankers would be exposed to extreme North Atlantic conditions and would have to operate in fog and ice-filled waters. Moreover, as the frequency of traffic increases, so does the risk of accidents. The Hibernia Panel therefore recommended that the shuttle tankers be designed with double, ice-strengthened hulls. It also recommended that a mechanism be established to ensure the safe routing of tankers from the Hibernia site.

Mobil acknowledged that clean-up efforts would have limited effect because there are no practical methods of recovering oil in ice-covered seas. The company predicted a 20 per cent recovery rate in summer and less than 5 per cent in winter. More recent evidence suggests that it was optimistic in its estimates. According to a report from the Canadian Petroleum Association, only 1.5 to 12 per cent of oil from a blowout could be removed. From what we have seen and heard in the course of our review, we believe that even less could be cleaned up from amajor tanker spill.

While some participants at the Newfoundland hearings expressed concern that the additional tanker traffic, offshore terminal and onshore reception terminals pose new risks to the environment, we have not been tasked with considering whether this project should be allowed to proceed, nor have we the expertise that would qualify us to do so. We endorse the recommendations of the Hibernia Panel and, in view of the potential increased risk of spills, we feel it is especially crucial that contingency plans for Hibernia-related activity address response capability and other prevention and preparedness issues. Such contingency plans should also reflect the relevant findings of the various North Sea studies that have been completed subsequent to the Hibernia Panel's review.

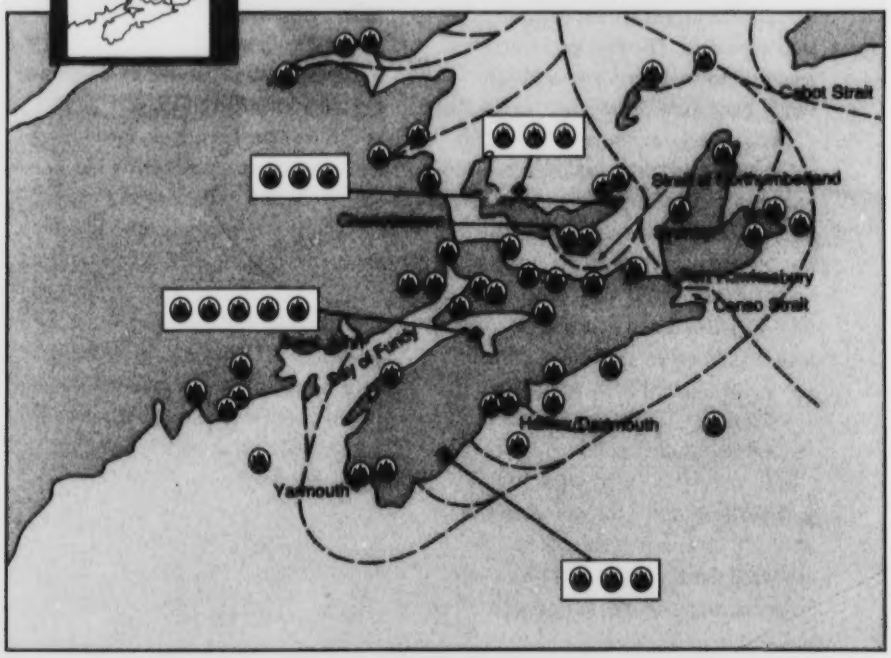
The Maritimes

Special features of the region

The Maritime provinces of New Brunswick, Nova Scotia and Prince Edward Island have a coastal shoreline of 11 487 kilometres, featuring sandy beaches, salt marshes, estuaries, rocky headlands and sheltered inlets and bays. The distinctive marine regions of the Maritimes are: the Gulf of St. Lawrence, the Gulf of Maine, the Bay of Fundy, Cabot Strait, Canso Strait, and the Strait of Northumberland.

Like Newfoundland and Labrador, the Maritimes are known for extreme ocean and weather conditions, including heavy fog and ice. Each winter, ice forms in the Gulf of St. Lawrence and around Cape Breton Island; in especially cold winters, ice can form throughout the region. In addition, tides of eight metres and associated tidal currents in the Bay of Fundy are among the highest in the

Major Tanker Routes and Environmentally Sensitive Areas: Maritimes



Legend

- Environmentally sensitive areas*
- Major tanker routes

* Includes coastal and marine parks, wildlife sanctuaries and conservation areas

"It's been said over and over again that Canadians are prepared to take costs for environmental safeguards. I believe that the government should take this message to heart and spend now, and spend well, while the mood is right."

Kirk Munro,
Maritime Fishermen's Union

world. Weather systems passing over the Maritimes can produce violent cyclonic storms, particularly during the winter months, with winds of up to 180 kilometres per hour and waves as high as 30 metres. Between August and October, the region can also be affected by the tail end of hurricanes originating in the Caribbean.

The coastal and marine waters of the Maritimes are ecologically important. They provide habitat for a wide variety of plant and animal species, as well as important breeding, feeding and staging grounds for seabirds, waterfowl and shorebirds. Alcids, cormorants and gulls breed on small islands throughout the Maritimes, and migratory waterfowl pass through the region during the spring and fall migrations. The piping plover, an endangered shorebird, also nests on sandy beaches in the region.

Low-energy environments, such as salt marshes and tidal flats, are especially vulnerable to damage from oil spills, because there ecological activity is greater and the natural degradation process is slower. Migrating shorebirds rely on productive feeding habitats in these areas. As many as 1.4 million of them rely on the upper Fundy tidal flats alone.

Whales and seals can also be found throughout the Maritimes. The Bay of Fundy alone is home to some 1000 harbour seals during the summer, and about 15 species of whales have been recorded there, including minke, humpback and right whales, an endangered species.

The Gulf of Maine could also be singled out as particularly vulnerable to damage from an oil spill. The area has a lucrative scallop industry and marine plants such as Irish moss, dulse, rockweed and kelp are harvested commercially there.

For centuries, fishing has played a vital role in the economy of the Maritimes. Hundreds of coastal communities depend almost entirely on the fishery. A multi-species fishery based on cod, haddock, redfish, herring, mackerel, lobster, oysters, and scallops is therefore of major regional importance. In 1988, the landed value of fish totalled approximately $500 million; the processed value, $800 million. A growing aquaculture industry is producing blue mussels, Atlantic salmon, rainbow trout, tuna and European oysters, as well as experimenting with other fish species. Millions of dollars have been spent developing a viable industry, particularly the salmon fishery in the Bay of Fundy.

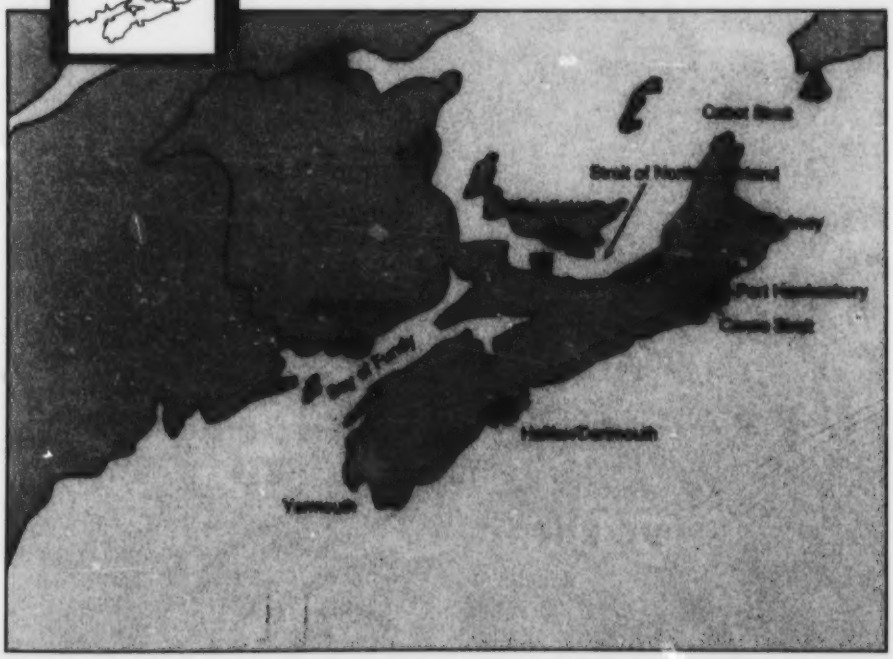
Tourism is also economically important to the Maritimes. The natural beauty of the coastal environment, recreational fishing, and whale and bird watching are just some of the attractions of the region. In addition, provincial and national parks provide access to many of the outstanding natural and historical highlights of the Maritimes.

Vessel traffic

The Maritimes are open to shipping year-round. During the winter, and when severe ice conditions exist, the Canadian Coast Guard provides advice on routing and icebreaker support. Vessel traffic includes oil tankers bound for ports in the region, as well as for the St. Lawrence, the Great Lakes, and the east coast of the United States. In 1988, 22.8 million tonnes of crude oil were shipped to ports in the Maritimes; 6.8 million tonnes of refined products were imported; 3.8 million tonnes of oil from the refinery at Come By Chance, Newfoundland were shipped through the Maritimes to ports in the eastern United States; and 8.8 million tonnes of crude oil from international sources passed through the region enroute to the United States.

Tug and barge combinations are being used more frequently than tankers to ship oil. The use of integrated tug-barge units (pusher tugs) of up to 40 000 dead-weight tonnes and conventional tug and barge combinations with towlines represents a low-cost alternative to tankers. However, oil barges are unregulated and subject to inspection under the *Canada Shipping Act* only for load-line requirements; therefore, they represent a significant environmental risk. In 1988, barges made 135 voyages in the Maritimes, and this traffic is expected to increase.

Pilotage Zones in Canada: Maritimes



Legend

Compulsory pilotage zones

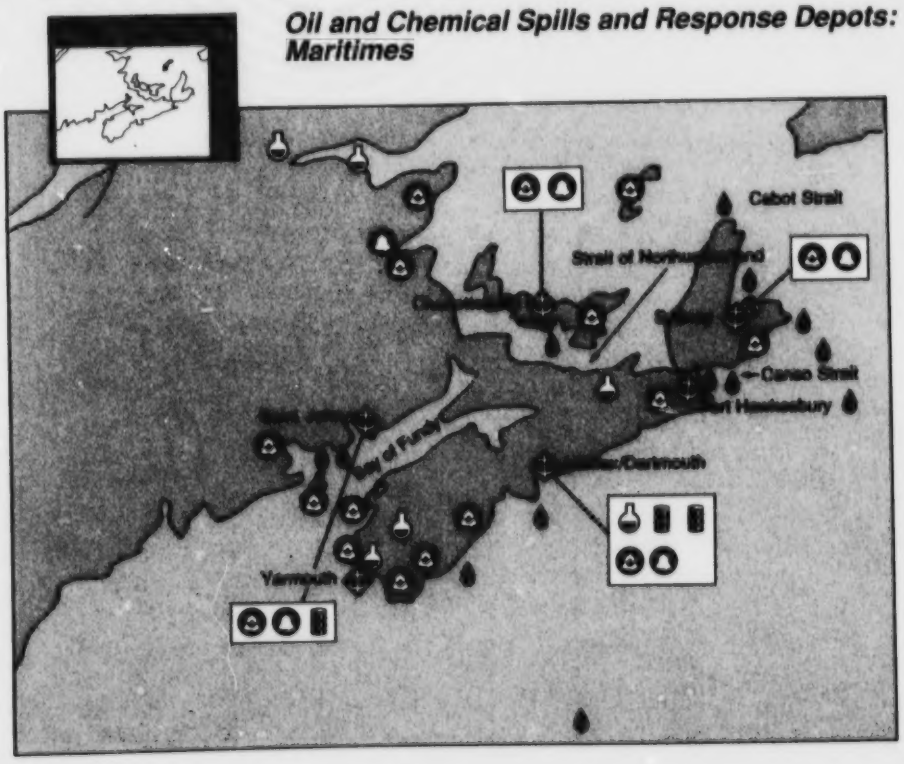
Dangerous goods and chemicals such as octane, caustic soda, butane and sulphuric acid are also shipped to Maritime ports and pass through the region en route to ports on the east coast of the United States. In 1987, an estimated 2.2 million tonnes of dangerous goods were shipped to, or through, Halifax on 550 vessels, while smaller amounts passed through other ports in the region. The following year, the number of vessels shipping to, or through, the port of Halifax alone increased to 700.

Saint John and Halifax are the two principal ports in the Maritimes. Oil tankers — including very large crude-oil carriers (VLCCs) — are regular visitors to both ports because both have refineries. The Irving refinery in Saint John is the largest of its kind in Canada and has a daily output capacity of 32 000 tonnes. VLCCs in excess of 350 000 dead-weight tonnes supply crude oil to the refinery by offloading their cargo through a buoy anchored in Saint John harbour. The number of VLCCs delivering cargo to Irving each year has ranged from 23 to 37 between 1985 and 1989. The refineries in Halifax have a combined daily output capacity of 17 000 tonnes.

Recent spills

Because of their exposure to the open sea, dependence on marine resources, and strategic location near North Atlantic shipping lanes, the Maritime provinces

Oil and Chemical Spills and Response Depots: Maritimes



Legend

- Major port
- Past oil and chemical spills
- Chemical facility
- Oil refinery
- Industry spill response depot
- Government spill response depot

are especially vulnerable to tanker spills. Each year, hundreds of tankers pass through, or near, the area. There are three oil refineries in the Maritimes and a coastal trade which supplies local needs. Nova Scotia and New Brunswick, in particular, run the risk of a disastrous spill from a U.S.-bound tanker, without any benefit from shipments, and with little capacity to control either the danger or the damage.

Between 1975 and 1987, 74 tanker spills were reported in the Maritimes. Thirty-seven of these occurred in or around New Brunswick, releasing a total of 210 tonnes; thirty-three in Nova Scotia (8242 tonnes total) and four in Prince Edward Island (198 tonnes total).

Since 1970, the Maritimes have suffered four major oil spills as a result of one barge sinking and three tanker accidents.

Due to a navigational error, the tanker *Arrow* grounded on Cerberus Rock in Chedabucto Bay in February 1970. Bad weather and limited visibility contributed to the accident, in which the tanker split into two and sank, releasing about half of its 16 000-tonne cargo. Extensive clean-up of the resulting pollution was required. The monitoring program continues to the present and, while the beaches at Chedabucto Bay are said to be 99.9 per cent clean, at the public hearings we learned that hydrocarbons are still detectable on some beaches and traces of relatively unweathered oil can still be found on beaches near the Bay. Current Canadian marine pollution prevention legislation was prepared and enacted largely as a result of the *Arrow* spill.

In September 1970, the barge *Irving Whale*, carrying 3 800 tonnes of Bunker C fuel oil salvaged from the *Arrow*, sank in 75 metres of water in the Gulf of St. Lawrence while under tow. Divers secured the vents on the barge to control cargo leakage, but no attempt was made to salvage the barge or its cargo. Approximately 80 kilometres of shoreline on the Magdalen Islands were oiled and 250 000 bags of oily debris were recovered during clean-up operations. The barge remains undisturbed where it sank. The Canadian Coast Guard conducts regular diving surveys, most recently in October 1989, to ensure that the barge and its cargo are secure and pose no environmental threat. As yet, there are no plans to attempt to recover the cargo.

In 1974, the *Golden Robin*, a tanker fully loaded with Bunker C fuel oil, ruptured several cargo tanks when it grounded near the Restigouche River en route to Dalhousie, New Brunswick. The tanker spilled 160 tonnes of oil.

Finally, in 1979, the tanker *Kurdistan*, with its cargo of Bunker C fuel oil, ran into ice near Cabot Strait and its hull suffered a brittle fracture. The *Kurdistan* broke into two and spilled more than 7000 tonnes of oil. Nearly one million bags of oily debris were collected from 1320 kilometres of shore in Nova Scotia and Newfoundland during the clean-up, which lasted more than six months.

The hearings

Hearings were held in Halifax and Sydney, Nova Scotia; Saint John, New Brunswick; and Charlottetown, Prince Edward Island. Thirty-nine submissions were made by government agencies, pilotage authorities, labour organizations, public interest groups, legal associations, industry, private business and elected representatives.

At the time of the hearings, we observed several oil slicks in Halifax harbour and listened to local concerns about what was seen as inadequate surveillance and enforcement. People felt that spills were either deliberate or the result of negligence, and could be reduced, or even eliminated, through a vigorous and well-publicized program of investigation and prosecution.

The *Kurdistan* spill was described from various perspectives. The Coast Guard explained the procedures followed to achieve what it considered to be a successful clean-up operation and the changes implemented within its own organization as a result of lessons learned from the incident. The Department of Fisheries and Oceans pointed out that only about 15 per cent of the oil spilled in tanker accidents is recoverable after it has reached shore. The *Kurdistan* spill emphasized the need for improved shoreline clean-up methods and new techniques for accelerating natural degradation processes. The need for more university-based spill research and adequate funding for research was also stressed in several submissions.

While recognizing that prevention of marine spills must be the "first order of mariners", Prince Edward Island's Deputy Minister of the Environment stressed that a lead agency should be appointed in the event of marine accidents and that its role should be well defined. Although Prince Edward Island is Canada's smallest province and its resources are limited, it has prepared an emergency plan to contribute to an integrated regional plan. However, in order to maximize the effectiveness of such a plan, the province stated that the roles of the various interveners would have to be clearly defined, in particular the role of its own Ministry of the Environment in relation to that of other response agencies.

Experienced mariners, pilots and marine surveyors expressed concern over the fact that human error causes a very high percentage of tanker accidents, most of which are completely preventable. In recent years, crew sizes on tankers have been reduced, resulting in increased responsibilities and greater fatigue and stress for the remaining crew members, especially during tanker loading and unloading. Standards of watch-keeping have also suffered because of reduced crew sizes.

The role of pilots and ice pilots in ensuring safe navigation in ports and pilotage zones was highlighted by mariners and pilots. One submission related an incident in which an ice pilot on board the tanker *Dodsland* worked closely with the vessel's captain in monitoring and reporting ballast-tank flooding. Based on this information, the vessel was diverted from its original route, through the ice-filled Gulf of St. Lawrence, to Halifax, where major fractures in both sides of the hull were discovered and repaired. Had the vessel proceeded through the Gulf, a catastrophic hull failure and a major oil spill would almost certainly have occurred. Several submissions from

"Our principal, and indeed our only, reason for existence under the Pilotage Act is safety. The Authority has neither the skills nor the equipment to clean up oil spills and, therefore, its only duty is to take every precaution to ensure that spills do not occur. Prevention is our aim."

Captain Thomas Sellers, Atlantic Pilotage Authority

pilots' associations expressed concern about reductions in crew size, the decreased competence of crews, the need to control defective ships and the need for joint industry-Coast Guard guidelines for monitoring oil tankers and chemical carriers in eastern Canada's ice-control zones.

Several submissions stressed the importance of complete and up-to-date environmental information for effective spill response. Accurate environmental data bases, keyed to maps by geo-referencing, are becoming available through new computer technologies described by the Inland Waters, Coastal and Ocean Information Network (ICOIN). Some people also explained computer-based spill-trajectory models that make use of real-time weather and sea-state information and commended their role in spill response.

Oil spill response equipment is distributed throughout the Maritimes. The Canadian Coast Guard maintains equipment depots at Mulgrave and 17 other locations in the region. In addition, spill cooperatives have equipment at selected coastal facilities. Concern was expressed about the scarcity of equipment for responding to chemical spills. ICI Canada Inc. (formerly CIL), in Dalhousie, is the organization that is best equipped to respond to major chemical spills in the region. There was also concern—and this was shared by us — about the fact that Irving Oil, the major shipper and refiner of petroleum products in the Maritimes, does *not* belong to, or support, the regional spill cooperative.

We had expected to learn a great deal from the Coast Guard's experience in the Maritimes and to find the region well prepared to respond to spills. Perhaps the region's history of major spills had given us unrealistic expectations. However that may be, we were disappointed to find that in an area so large, so critical, so busy and so prone to mishap, the Coast Guard did not identify a serious need or express a desire to improve its current spill response capacity. This was of particular concern in view of industry's very limited cooperative capacity for clean-up operations in the region.

The lack of dedicated aircraft surveillance capability in the region was also identified as a serious problem at the hearings.

While in the Maritimes, we visited several important government and industrial facilities. In Nova Scotia, we went to the Bedford Institute of Oceanography, the Department of Fisheries and Oceans' largest research facility, which also houses scientific and technical staff from the Department of Energy, Mines and Resources and Environment Canada. We were briefed by Bedford scientists on ongoing research methods of enhancing the natural aging of oil stranded on beaches; techniques for tracking spilled oil using drifter buoys and satellites; the challenges of oil-spill-trajectory modelling; and exercise programs, including Canada-United States joint exercises. We also had the opportunity to see a demonstration of the PINS (Precise Integrated Navigation System) electronic charting system, aboard the *F.C.G. Smith*, a modern hydrographic survey vessel stationed at the Institute.

Finally, we toured the Canadian Coast Guard's Vessel Traffic Services Centre in Dartmouth, a facility regarded as the most sophisticated in Canada, the Coast Guard College in Point Edward, and the equipment depot and emergency response centre at Mulgrave, Nova Scotia.

It's nothing to find up to 11 nationalities on a ship."

Captain Barry J. Scott, Scott Marine Technical Services Limited

In Saint John we again encountered oil slicks, but little interest in cleaning them up or in charging those responsible for them. There we visited the Irving refinery and its marine terminal facilities, and Saint John Shipbuilding Limited, a major shipyard using unitized construction methods.

Recommendations

I. Spill response equipment

Oil spill response equipment is distributed throughout the region, whereas equipment for responding to chemical spills is maintained primarily by private industry.

Recommendation 6-9

In order to provide an effective regional response capacity, spill equipment depots be augmented with modern oil and chemical spill response equipment located at depots in Halifax and Saint John, as well as at all ports and terminal facilities where petroleum products are handled. This capacity be integrated with that of the industry cooperative planned for Halifax.

II. Aerial surveillance

Like Newfoundland, parts of the Maritimes experience chronic oiling of their shorelines, and this has devastating effects on seabird populations. Ships carrying large volumes of crude oil and refined petroleum products are but a portion of the regional and transatlantic traffic to the east coast of the United States. It is known that many vessels entering Canadian waters at the end of their North Atlantic crossings discharge oily bilge or oily tank washings before reaching port. This unnecessary and irresponsible practice must be stopped. Currently, Canada does not have a regular surveillance program in the Maritime provinces to detect the discharge of oily waste and to charge polluters.

Recommendation 6-10

In order to deter illegal dumping of wastes, there must be regular aerial surveillance of the waters off the Maritime provinces.

III. Salvage tugs

Distressed vessels, such as oil tankers and VLCCs, can only be assisted effectively by powerful, properly equipped ocean-going tugs. Assist tugs must be available on stand-by and be regionally located in order to provide ready assistance to distressed vessels.

Recommendation 6-11

In order to reduce the risk of a major spill, one or more ocean-going tugs or offshore support vessels be stationed in Maritime waters at all times.

IV. Pilotage

Waters in areas of the Maritimes are ice-covered or ice-filled for various periods of time each year. Re-routing can easily send a loaded tanker to an ice-bound port, even though it may not be prepared or constructed to navigate those waters. In fact, some tankers moving through ice in the Gulf of St. Lawrence *are not* built for such a voyage. Further, because the master of such a ship may not really appreciate the hazards of ice, and because special skills are required to navigate safely under such conditions, the presence of an ice pilot or ice advisor is especially important.

Recommendation 6-12

In order to reduce the likelihood of accidents, the Coast Guard develop guidelines for the operation of tankers and chemical carriers in ice. Furthermore, to reduce the risk of accidents resulting from lack of experience navigating icy waters, the Coast Guard develop manning regulations requiring that all foreign oil and chemical tankers transitting the Gulf of St. Lawrence under icy conditions have an ice pilot or ice advisor on board.

V. The Irving Whale

We are not satisfied that the Coast Guard's periodic monitoring of the *Irving Whale* is as thorough or as intensive as the circumstances warrant.

Recommendation 6-13

To determine the ongoing risks of oil seepage from the wreck of the Irving Whale, which now rests on the floor of the Gulf of St. Lawrence with an undetermined amount of Bunker C cargo still on board, the wreck should be examined in 1990 and a decision made as to whether or not to remove the oil and/or raise the barge.

VI. The Canaport Monobuoy

It appears that Irving Oil, Canada's largest oil refinery, has not performed contingency exercises in two years. The infrequency of exercises at the refinery does little to ease the apprehension of the interveners who expressed concern about the safety of theCanaport Monobuoy. The Monobuoy is a unique facility for off-loading oil from supertankers, a floating platform to which tankers are moored and their cargo sent ashore by underwater pipeline.

Recommendation 6-14

To ensure the safe operation of Irving Oil's Canaport Monobuoy, the Canadian Coast Guard review all aspects of the operation of the facility, including weather conditions in which vessels will be permitted to moor or remain moored, cargo-transfer procedures, the need for a permanent boom system, staff training and supervision.

VII. Aquaculture Industry

In view of the importance of the aquaculture industry to the economy of the Maritimes, we feel that present measures to protect aquaculture sites from the effects of nearby spills are inadequate. Therefore, we would urge the aquaculture industry to pursue further research and development activities to protect operations such as herring weirs and lobster ponds in cooperation with Environment Canada and the Department of Fisheries and Oceans.

Recommendation 6-15

Aquaculture industry representatives should collaborate with Environment Canada and the Department of Fisheries and Oceans to develop oil and chemical spill contingency plans.

"One of the problems in dealing with wildlife, of course, is that it is very difficult to put a price tag on, say, the value of an eider duck or the song of the white-throated sparrow, or whatever it may be."

Peter Pearce,
Environment Canada

The St. Lawrence River

Special features of the river

The St. Lawrence River is approximately 1600 kilometres long and drains a vast land area of more than 670 000 square kilometres. Not only is it a unique waterway, with its winter ice cover and narrow, twisting channels, but it is also one of the most difficult to navigate in the world.

The region is characterized by fluctuating winds, as well as considerable variations in water and air temperatures. The St. Lawrence itself has complex hydrodynamics, making oil spill countermeasures difficult: each section of the river requires a different response. It is generally recognized that the St. Lawrence has six distinct sections or features:

- There is a freshwater section between Kingston and the eastern reaches of Montreal that has a fast current, except where the river widens to form small lakes.
- Between Montreal and Trois-Rivières, it has wider sections and is marked by shallow lakes.
- Between Portneuf and Quebec City, there is a freshwater estuary where the tide reverses.
- Downstream from Quebec City, the river becomes a brackish estuary subject to strong tides and complex currents.
- Before reaching the Gulf of St. Lawrence, it becomes a very deep maritime estuary characterized by the stratification of both salt and fresh water.
- In the Gulf itself, large stretches of water circulate in a clockwise direction.

The St. Lawrence has a very diverse environment that is ecologically rich and extremely vulnerable. There are more than 260 bird species in the river corridor. Large groups of alcids, northern gannets and cormorants, among others, populate the estuary and the Gulf. During the migratory season, the banks of the river harbour 700 000 birds, representing more than 30 waterfowl species.

The river basin is equally rich, with 240 species of fish, approximately 100 of which live in fresh water. In the salt water of the estuary and the Gulf there are 5 species of seals and 18 species of whales. Canada is one of the few countries in the world to have resident inland populations of beluga and Greenland whales, both present in the St. Lawrence. The total number of large sea mammals is between 2350 and 4700.

The flora of the river and its banks is also exceptionally abundant. Over 600 species of aquatic and riparian plants have been identified, including more than 140 rare species. Most of these are found in the Lac St-Pierre habitat.

Hundreds of wetlands scattered along the banks of the river enhance its ecological value. Two of these, the Cap Tourmente reserve and the Baie de l'Île Verte reserve, have been designated world heritage sites. Lakes St-Louis, St-François and St-Pierre have borders of submerged and surface water-plant communities that cover a total area of 30 000 hectares.

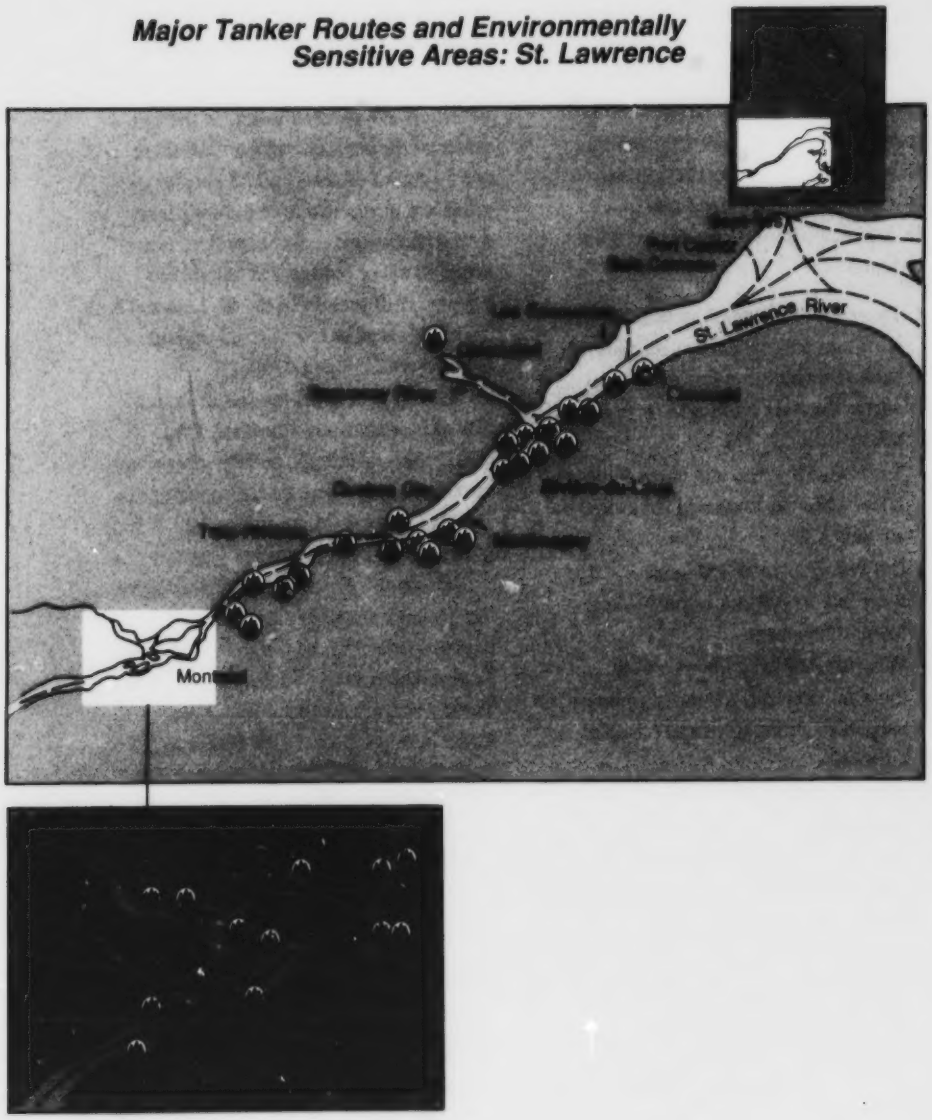
The profusion of fauna and flora in the St. Lawrence basin is nevertheless threatened by serious degradation. Major programs have been introduced to maintain the basin and clean up the

"Though I have 30 years' experience, I can tell you human error is always there. It's always waiting in the wings. Sometimes it's just not your day. In order to reduce human error, I think training people in depth would already be an advance, involving them totally in the form of transport we're using."

Norman Hall,
Canadian Shipowners Association

St. Lawrence and its tributaries. The first such program — introduced in the early eighties by the Quebec government — was an ambitious water purification program that made it possible for the vast majority of cities and towns in Quebec to equip themselves with waste-water treatment facilities. Some 40 water intakes, serving 82 separate municipalities, are located along the St. Lawrence. Almost half the province's population relies on the river for its drinking water. Programs to protect the banks of the river and develop natural sites along it were subsequently introduced. The most recent initiative to provide ecological protection

Major Tanker Routes and Environmentally Sensitive Areas: St. Lawrence



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Environmentally sensitive areas*

Major tanker routes

* Includes coastal and marine parks, wildlife sanctuaries and conservation areas

for the St. Lawrence is the five-year plan to clean up and preserve the river. Its primary objective is to reduce by 90 per cent the liquid waste from the 50 industries along the banks of the St. Lawrence and the Saguenay that pollute the most.

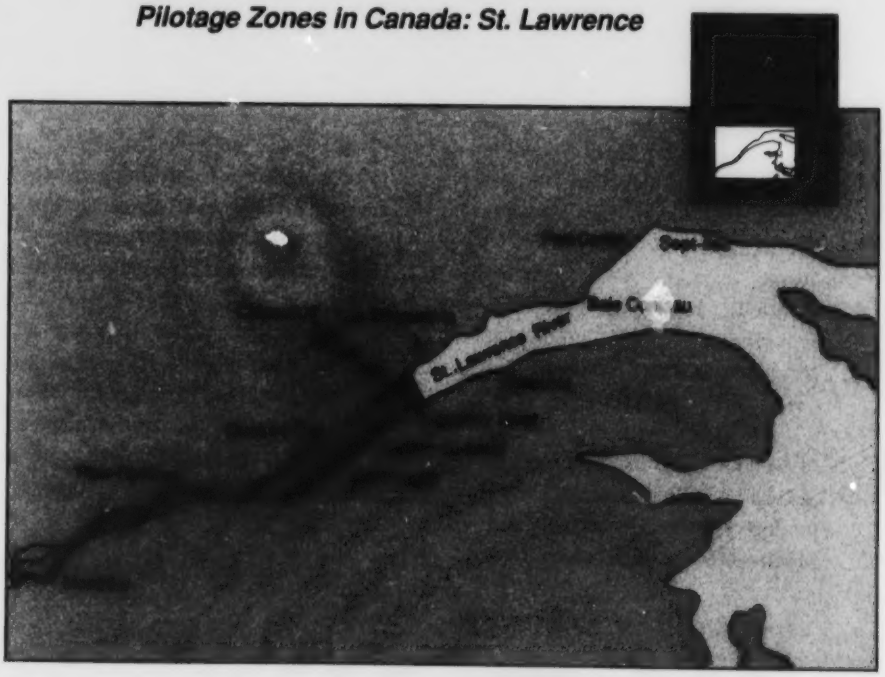
Through these programs, the federal, provincial and municipal governments are currently spending over $10 billion on cleaning up and preserving the river. This must be considered in any evaluation of the environmental risks associated with the transportation of oil products and chemicals on the St. Lawrence: just one major catastrophe would imperil 10 years of government effort and investment.

The St. Lawrence is also a significant economic resource. Commercial fishing remains the economic mainstay of several towns and villages in eastern Quebec. More than 6800 fishermen earn their living from the St. Lawrence. In 1987 their total catch weighed over 97 000 tonnes and was worth $126.2 million. In addition, the harvesting and processing of fish products provided 12 500 jobs in Quebec that year. In 1988, the value of these processed products grew to $210 million.

Vessel traffic

The St. Lawrence River plays an important role in the national transportation network. Its economic value can be measured in terms of the number of jobs it provides, the volume of traffic, and the total tonnage of goods transported. However, we must bear in mind that there are environmental risks associated with these economic benefits.

Pilotage Zones in Canada: St. Lawrence



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Compulsory pilotage zones

"The problem — the question of training or information to be provided, because to give training is to provide information. This also helps to raise the level of awareness of each citizen about protecting his environment. So getting the people in a community more involved is a matter of killing two birds with one stone."

Eva L. Côté (Alderman), City of Rimouski

The St. Lawrence is used intensively in spite of the fact that it is difficult to navigate. Each year, more ships pass through the St. Lawrence Seaway than through the Panama and Suez canals combined. In 1988, for example, 19 000 ships transported a total cargo of 111 million tonnes. With such a heavy volume of traffic, the risk of accidents is always high.

The transportation of oil products and chemicals by tanker clearly poses the most serious risk. In 1988, such traffic accounted for 18.7 million tonnes, or 17 per cent of the total volume of goods shipped through the St. Lawrence. Refined petroleum products led the way with 10.8 million tonnes, followed by crude oil with 6.9 million tonnes, and chemicals, with just under 1 million tonnes.

Close to 3.5 million tonnes of refined products and 5 million tonnes of crude oil passed through the Port of Quebec in 1988, making it the busiest oil port in the region. Shipping crude oil through Quebec City represents by far the greatest risk for the St. Lawrence River, because the capacity of the ships involved can be as high as 160 000 tonnes. Approximately 60 tankers ply the waters to Quebec City each year, most of them with a draught very close to the maximum depth of the channel. They have to manoeuvre very carefully through the Traverse Nord, downstream from Île d'Orléans, and in the Port of Quebec itself.

Since 1988, smaller tankers have made 200 trips to transport approximately 7.4 million tonnes of petroleum products between Quebec City and Montreal. These ships, which may displace up to 25 000 tonnes, have to pass through areas where the currents are very strong (up to 4 to 6 knots), in a tortuous channel with an average width of less than 300 metres.

It is important to note that tankers operate year-round in the St. Lawrence, sometimes in critical ice conditions. Ice jams make several sections of the river especially hazardous, particularly where they accumulate very quickly, as they do below the Quebec Bridge, upstream from the port.

Recent spills

In the last 10 years, 242 chemical spills have been reported in Quebec. As for oil spills, the Canadian Coast Guard reported 307 of them in the Laurentian Region (from the St-Lambert lock to the Gulf of St. Lawrence) resulting from ship operations, of which 68 per cent occurred within ports under the jurisdiction of Ports Canada. Bilge pumping was associated with 37 per cent of these incidents; oil transfer with 31 per cent. As usual, most spills were caused by human error (73 per cent) and mechanical breakdown (10 per cent). It is worth noting that tankers were involved in 19 per cent of the spills, which accurately reflects their relative importance in overall vessel traffic on the St. Lawrence.

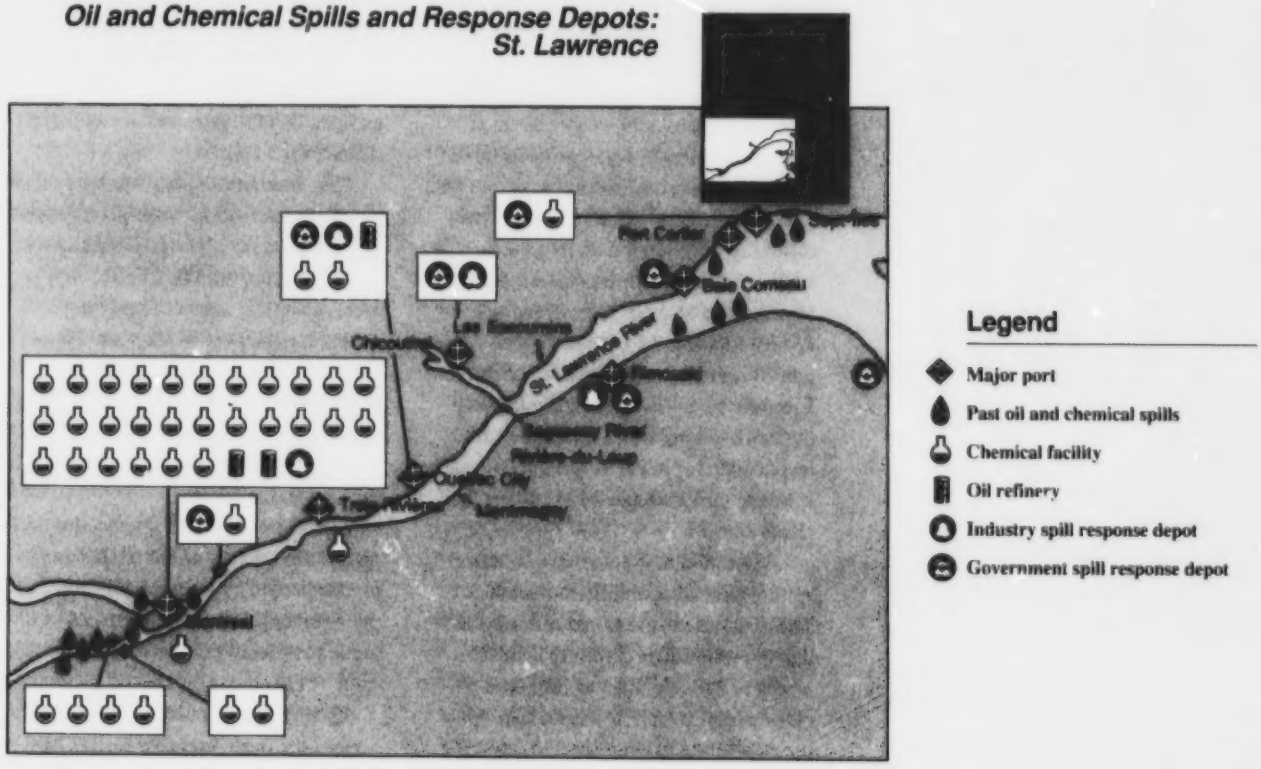
Over the same period, 15 marine accidents led to spills in the Quebec portion of the St. Lawrence River. Eight of these were caused by groundings, and the rest by other types of accidents. Two spills in particular were brought to our attention:

the December 1985 *Pointe-Lévy* spill, which spread over 224 kilometres of shoreline off Matane, and the May 1988 spill from the tanker *Czantoria*, which hit the Quebec Ultramar dock and spilled 320 tonnes of light crude that covered the banks of the river over a distance of approximately 100 kilometres.

No one has been able to accurately determine the total volume of petroleum products spilled in the St. Lawrence in the past 10 years. As is true across the country, most people involved in spill operations distrust estimates and are extremely wary of comparisons. One spill alone, near Quebec City in April 1989, was estimated at 227 litres by the Canadian Coast Guard and Ultramar, and at 6819 litres (higher by a factor of 30) by Quebec's ministère de l'Environnement (Ministry of the Environment).

According to Environment Canada estimates, however, the 641 spills recorded in the region from 1971 to 1988 account for 4000 tonnes of petroleum products, of which 30 per cent (1200 tonnes) was released as a result of the 19 marine accidents.

Oil and Chemical Spills and Response Depots: St. Lawrence



The hearings

There were four days of hearings in Quebec: October 10 and 11, 1989 in Montreal, October 12 in Rimouski, and October 13 in Quebec City. These hearings made it possible for 34 groups and individuals to present briefs — 15 in Montreal, 9 in Rimouski and 10 in Quebec City. The main concern raised was the difficulty of navigating on the St. Lawrence. Four submissions referred to the pilotage system and the proposed modifications to the governing regulations.

The Montreal hearings provided insight into a spill that occurred in an area under the jurisdiction of a federal harbour authority. Four days prior to the hearings, a foreign ship that regularly stops at the Port of Montreal spilled an estimated 15 tonnes (a figure not confirmed by the Port) of bunker fuel. Testimony from the Montreal harbour master illustrated the difficulty of mounting an immediate response when there are no resources allocated for that purpose. In the case discussed, clean-up operations only began 24 hours after the spill occurred. Even the harbour master admitted that the work did not begin until the vessel responsible for the spill recognized that it was at fault and agreed to pay for the clean-up.

Environment Canada also called its spill response capability into question. The department's regional officers felt that the techniques currently available would not enable them to deal with an oil or chemical spill in the St. Lawrence because of the uneven shoreline and the strong currents and tides.

The St. Lawrence Seaway Authority regretted the fact that currently there are no satisfactory measures for responding to chemical spills. The growing number of hazardous products being shipped, and the problems involved in providing accurate information about these products, have made the Seaway Authority concerned about the widespread lack of information on the potential environmental impact of chemical spills.

It was also in Montreal that an important submission was made by Canadian owners and operators of tankers. Through the Canadian Shipowners Association, the major marine shippers of petroleum products and chemicals, including Socanav and Enerchem Transport, presented detailed briefs supporting their safety standards. The Association also emphasized the negative economic impact of double hulls and double bottoms, and recommended that Canada not take unilateral action in this regard.

The hearings also assessed the radar coverage required for satisfactory monitoring of sensitive navigation areas and converging traffic. The Quebec Bridge area, as well as areas currently not covered in the Port of Montreal zones (Cap St-Michel) and the Traverse Nord (from Île d'Orléans to Cap Gribane), were identified as priorities for extension of radar coverage by the Coast Guard in the Laurentian Region.

We also noted with interest the efforts of Quebec universities to adapt research to the specific hydrographic features of the river and to the characteristics of the crude petroleum products most frequently used by Quebec refineries.

In Rimouski, several researchers described the most sensitive zones downstream from Quebec City, particularly the habitat of the threatened beluga whale. Submissions from two municipalities and one chamber of commerce indicated community interest in preserving

"What fishermen fear most is a big tanker having an accident somewhere around the mouth of the Saguenay. With the tides and winds around that area, in several hours large stretches of spawning grounds and fishing zones could be irrevocably polluted. If the spawning grounds were affected, it could have an impact on the entire Gulf in terms of the available volume of resources."

François Poulin,
Alliance des pêcheurs commerciaux du Québec

the ecological balance of the river. The three participants said they were prepared to coordinate the involvement of volunteers to assist in response and recovery operations, although they had never received any specific information on how to do so.

Finally, the Quebec Petroleum Association described its Rimouski spill response cooperative, one of several that it administers. The Association stated that it would like to see improved communication among the various parties involved in spill operations, as well as more frequent response exercises.

Also noteworthy was the Quebec City hearing, at which industrial users described an experiment they are participating in — the cooperative management of a harbour terminal in Bécancour (between Montreal and Quebec City on the south shore of the St. Lawrence). Their testimony highlighted the speed and efficiency of the port's response capability.

Response capability, shipping and transshipping operations were also the main subjects covered in the submission from Ultramar, the only Quebec refiner that agreed to appear at a hearing held in the region where its operations take place. Among other things, Ultramar discussed its policy concerning the use of tugboats at its St-Romuald ship terminal. The company, which holds a weekly spill response exercise and deploys booms every two weeks, also stated that it was prepared to handle any spill beyond the immediate vicinity of its refinery, whether or not it was directly involved in the incident.

The complexity of the systems for coordinating and directing response operations was criticized on several occasions during the Quebec City hearing. Groups such as GIRAM (Groupe d'initiatives et de recherches appliquées au milieu) emphasized the slow response time.

Collaboration between government and industry was also addressed in a submission that described the only major joint exercise ever held in Canada, JOSREP (Joint Oil Spill Response Emergency Plan), which took place in Quebec in 1987. More than 100 individuals and groups took part in this exercise which, to our surprise, was theoretical only; no oil was spilled or equipment deployed on the test site (the Traverse Nord).

Recommendations

I. Navigational aids

Navigation on the St. Lawrence River is assisted by 2700 beacons, buoys and lighthouses. These are necessary to follow the path of the channel, which requires several changes in course, particularly upstream from Quebec City. The performance of this buoyage system, however, is highly variable, depending on weather conditions and visibility.

In winter, non-luminous buoys (spar buoys) are the most vulnerable; the moving ice frequently covers them completely or causes their anchors to drag. In addition, leading lights, which are an absolute necessity between Montreal and Quebec City, as well as in a number of other strategic locations (Traverse Nord), are not all equipped with emergency power supplies that are activated in the event of an electrical outage.

"The River, let me repeat, is too fragile and precious for us not to err on the side of health and protection."

Gaston Cadrin, GIRAM

Recommendation 6-16

In order to provide for safer navigation, the Canadian Coast Guard:

- *install fixed lateral references on land in the Traverse Nord and Lac St-Pierre areas to make it possible to navigate by radar alone;*
- *equip* ***all*** *leading lights with emergency power;*
- *install an electronic transponder for radar on Banc Morin, offshore from Pointe-au-Pic.*

II. Vessel traffic control

Given that vessel traffic on the St. Lawrence is relatively heavy and that navigation on the river involves specific difficulties, navigational aids and controls must be kept technologically up to date and suited to the pace of the shipping industry. Maintaining shipping safety on the river, however, is not simply a matter of tools, but also of regulations and their enforcement.

The following recommendations are based on technical inspections, as well as on the briefs submitted by key players in St. Lawrence navigation, in particular the Laurentian Pilotage Authority, pilots' associations, the Canadian Coast Guard, and the St. Lawrence Seaway Authority.

Recommendation 6-17

To improve vessel traffic control in the St. Lawrence region:

- *The modernization of radar, tracking system and communications equipment be completed for Montreal and Les Escoumins as proposed in the 1990-92 equipment plan.*
- *The Quebec Bridge area, the Port of Montreal from Cap St-Michel, the approach to the Port of Sept-Îles, the Traverse Nord, and the approach to Port Cartier should all have radar coverage.*
- *A regulation be introduced requiring that all vessels navigating the St. Lawrence be equipped with* ***two*** *VHF radios and that these be kept operational at all times.*
- *Mandatory traffic separation zones be established upstream and downstream from Les Escoumins to reduce the risk of accidents due to the proximity of vessels. These zones should extend as far as Cap-aux-Oies, immediately downstream from the crossing to Île-aux-Coudres.*
- *The Canadian Coast Guard be assigned statutory authority to restrict or temporarily stop traffic when conditions are deemed to be unsafe, especially upstream from Quebec City and the Traverse Nord when visibility makes it impossible to see spar buoys or leading lights in winter winds.*
- *The opening and closing of the St. Lawrence Seaway be subject to strict regulation for tankers and vessels transporting hazardous goods and that these be barred from mid-December to mid-April, regardless of seasonal variations in weather.*

III. Pilotage

The St. Lawrence River is a constant challenge for navigators. The challenge is even greater for part-time navigators, and may become critical for foreign navigators who are more familiar with the open sea. In such a context, pilotage services become essential to maintaining safe shipping on the St. Lawrence. Currently, pilots assist nearly all vessels that navigate the St. Lawrence upstream from Les Escoumins; however, a proposal to

amend the regulations could significantly change this situation. It is with this in mind that we evaluated the provision of pilotage services as part of the overall river transportation safety system.

Recommendation 6-18

- *To maintain the present standard of safety in District No. 2, the current proposal to reduce pilotage requirements in that district be withdrawn.*
- *The Laurentian Pilotage Authority examine the need to introduce a harbour pilot service for the approaches to the ports of Sept-Îles, Baie Comeau and Port Cartier, in District No. 3.*
- *The assistance of a pilot be compulsory during ice season for all foreign oil and chemical tankers between Port aux Basques and Les Escoumins, and between Sydney and Les Escoumins.*
- *The same medical norms should apply for all persons exercising similar advisory functions related to ice navigation.*

IV. Ship operations and transshipments

Most spills result from ship operations carried out at sea or in dock. These include bilge pumping, disposing of oily water ballast and ship-to-ship transshipment. The procedures for each of these operations should be reviewed and amended, and the appropriate equipment should be readily available and of high standard.

Controls over these operations also need to be tightened. Each year, approximately 10 ship-to-ship petroleum product transfer operations are carried out offshore from Bic or Pointe-au-Pic, yet the Canadian Coast Guard ship safety service has not inspected these operations for several years.

Recommendation 6-19

- *The practice of placing booms around tankers as a precautionary measure during hydrocarbon transfer operations should be reintroduced.*
- *Ship-to-ship cargo transfers on the St. Lawrence River should be restricted to a single site, which should be selected on the basis of its physical configuration in order to minimize the difficulty of clean-up operations.*

V. Response equipment

Four main groups own and manage marine spill response equipment in Quebec. The Canadian Coast Guard has seven depots along the St. Lawrence River in which dedicated spill response equipment worth more than $6 million is stored. According to the Coast Guard, this equipment would make it possible to recover a spill of up to 1500 tonnes under ideal conditions.

The Quebec Petroleum Association owns $2 million worth of equipment, which is held in six separate locations and is administered by six different cooperatives under the direction of local members of the Association.

Private businesses in Rimouski, Baie Comeau, Sept-Îles, Quebec City, Montreal and Chicoutimi own equipment on which a value has not been set. It generally consists of one or more pump trucks used to vacuum oil slicks. Refineries that have a ship terminal also own various quantities of equipment of undetermined value.

Overall, the St. Lawrence River region is grossly underequipped and lacking in terms of equipment efficiency. The present inventory of 2730 metres of 90-centimetre boom, serving seven district response depots without any high-rate

skimming capacity, would clearly be inadequate to contain or clean up a large tanker spill. Furthermore, the management of this equipment by four separate authorities does not appear to encourage optimal use of these tools.

Recommendation 6-20

- *The location and quantity of response equipment stored in the Laurentian region must be suited to the traffic risks, currents, tides, waves and ice conditions which prevail there.*
- *In order to protect the beluga whales and snow geese, special stores of equipment should be established and contingency plans developed in the Rivière-du-Loup and Montmagny areas.*
- *The response cooperative for the area between Montreal and Quebec City, whose establishment was announced in Calgary during the hearings, should be made operational at the earliest opportunity.*

VI. Vessel inspection

Vessel inspection is a national issue with special significance to the Gulf of St. Lawrence, because unseaworthy ships can operate there before entering port for inspection.

Recommendation 6-21

To eliminate unnecessary risks on the St. Lawrence, inspection capacity be weighted to provide ship inspection closer to the mouth of the Gulf (at Sydney or Sept-Îles), regardless of the port of destination.

VII. Tanker construction standards

Many opinions were expressed and recommendations made concerning construction standards for tankers. Most, including the inevitable debate over double hulls and double bottoms, are considered in Chapter 3 of this report. However, the St. Lawrence River poses special problems in winter, not the least of which is the difficulty of navigating in ice along the narrow channels.

In the winter of 1988-89, only 35 of the 55 tankers that navigated the ice on the St. Lawrence were appropriately ice-reinforced. The risk of losing control over a vessel because of the formation of ice in the engine-cooling-water inlets appears to raise serious concerns about navigation safety on the river.

Recommendation 6-22

All tankers navigating under icy conditions in the St. Lawrence River and in the Gulf should meet rigorous ice reinforcement standards and be equipped with stand-by generators and internal recirculation cooling systems. Within seven years, all tankers and barges operating during winter months must be double-hulled.

VIII. Channel dredging and keel clearance

The Quebec hearings highlighted a recent trend towards an increase in deep-draught vessel traffic on the river downstream from Quebec City. This is particularly true for the transportation of crude oil.

In its submission, GIRAM complained about Ultramar's sale of four of its medium-sized tankers (76 000 tonnes) and their replacement by two large 130 000-tonne tankers with a draught

of more than 15 metres. These larger vessels increase the risk of accidents when they cross limited draught zones. They must, therefore, cross at high tide. We are convinced that conditions in the St. Lawrence call for stricter guidelines with respect to keel clearance. When annual dredging operations are carried out, appropriate care should be taken in the disposal of the contaminated sediment collected.

Recommendation 6-23

In order to avoid groundings, the Canadian Coast Guard establish a minimum keel clearance for vessels using dredged channels.

IX. Environmental tools

The Department of Fisheries and Oceans has developed a fairly versatile data base on the St. Lawrence River that could prove to be very useful for identifying the areas of the river that are ecologically sensitive and for determining appropriate responses in the event of a spill. It includes four sources of data: a cartographic data base, a physical chemistry data base, a biological data base, and a series of maps on fishery resources. The system may be adapted to various emergencies, as well as for project impact assessments and resource-use planning. However, it is not specifically designed for environmental emergencies, and cannot therefore be used to accurately assess the sensitivity of coastal habitats. Ideally, we would like to see this system applied to environmental emergency operations on the St. Lawrence River.

Another useful tool is being developed by the Maurice Lamontagne Institute in the field of oil-spill-trajectory modelling. This is a first-rate research tool and should be completed for the whole of the Gulf and the estuary.

Accurate and timely weather forecasts can also greatly increase the effectiveness of response operations, particularly when it comes to predicting the movement of oil spills and deciding where to deploy people and equipment to recover and clean up oil. At present, however, real-time meteorological data for the St. Lawrence region is inadequate.

Recommendation 6-24

- *A meteorological buoy be established in the estuary to provide emergency response personnel with access to crucial real-time meteorological information.*
- *A spill-trajectory model, as well as comprehensive environmental sensitivity maps, be developed for the St. Lawrence.*

X. Contingency plans and exercises

All information we received about contingency plans and exercises indicates that plans are neither sufficiently detailed, nor precise with respect to the resources to be protected or the methods to be used to do so. They often describe the operators' recommended procedures, but their capabilities are not clearly defined. Moreover, exercises are infrequent and often theoretical.

"We realize again today that very few public, parapublic and private organizations possess detailed and comprehensive emergency response plans."

Jean-Pierre Gauthier, Environment Canada

Recommendation 6-25

- *A review of the contingency plans of all agencies and industries be undertaken, in order to verify their compatibility, and field simulations held annually to ensure their effectiveness.*
- *A major public awareness initiative be launched to inform all parties who may be involved in a spill of their responsibilities in these contingency plans.*
- *To protect water intakes, priority be given in all contingency plans to notifying managers of water treatment facilities of any incident or potential incident that may affect their operations. To facilitate this, the locations of drinking water intakes, and contact numbers for their operators, be clearly identified on maps and charts provided to vessels transiting the Great Lakes-St. Lawrence River system and to onshore response personnel.*

The Great Lakes

Special features of the region

The Great Lakes constitute the largest surface area of fresh water in the world (245 000 square kilometres, or roughly 20 per cent of the world's surface supply). They have 15 000 kilometres of coastline — 9000 of which are on the Canadian side — and for centuries have provided a crucial link between the Atlantic and the heart of the continent.

There are no tides, waves are not normally high (two to three feet) and the lakes do not freeze over completely in winter. Ice can be present at the shoreline for up to four months each year and severe winter storms are not uncommon. Despite lock closures along the St. Lawrence River, the Welland Canal and St. Mary's River during the winter, commercial vessels continue to ply the main waterways of lakes Erie, Huron and Michigan. Consequently, there is great dependence on the United States Coast Guard's icebreaking services.

Because they are a closed system, the Great Lakes are especially vulnerable to spills of oil or other hazardous materials; such incidents cause major, long-lasting damage. Retention times vary enormously from one lake to another. While it would take about three years to "flush out" Lake Erie, Lake Superior would require 60 times that. The flushing capability that does exist tends to direct toxic spills to connecting channels downstream. These channels are usually surrounded by densely populated areas which draw their drinking water from the Great Lakes. The fact that drinking water intakes serving approximately 24 million people in 240 regional municipalities dot the shores of the lakes along both sides of the border underscores the importance of spill prevention.

To protect the Great Lakes, in 1909 Canada and the United States established the International Joint Commission (IJC) to oversee the Boundary Waters Treaty. Later, in 1972, recognizing the serious degree to which the lakes had been abused and polluted, the two countries signed the Great Lakes Water Quality Agreement. The Agreement calls upon both countries to "restore and maintain the chemical, physical and biological integrity of the waters of the Great Lakes Basin ecosystem." Recently, the IJC identified some 42 "hot spots" — areas of the lakes so heavily contaminated that they require immediate remedial action.

Numerous provincial and state parks are situated along the shores of the Great Lakes, including Point Pelee National Park, an internationally renowned bird sanctuary. The region is home to countless species of fish, birds, waterfowl and other animals. Many are threatened, however, by pollution resulting from population growth, industrial discharges and accidental spills.

During the spring and fall migrations, when thousands of waterfowl and other species of birds gather in specific areas, populations are concentrated and thus especially vulnerable to spills.

Black ducks, mallards and common mergansers are the most abundant waterfowl from the Bruce Peninsula to Sauble Beach. During the spring, the eastern shores of Lake St. Clair and Walpole Island have the highest number of waterfowl days per hectare in the region (50 000) and autumn (150 000). Further east, large portions of the continental populations of both canvasbacks and redhead ducks often congregate along

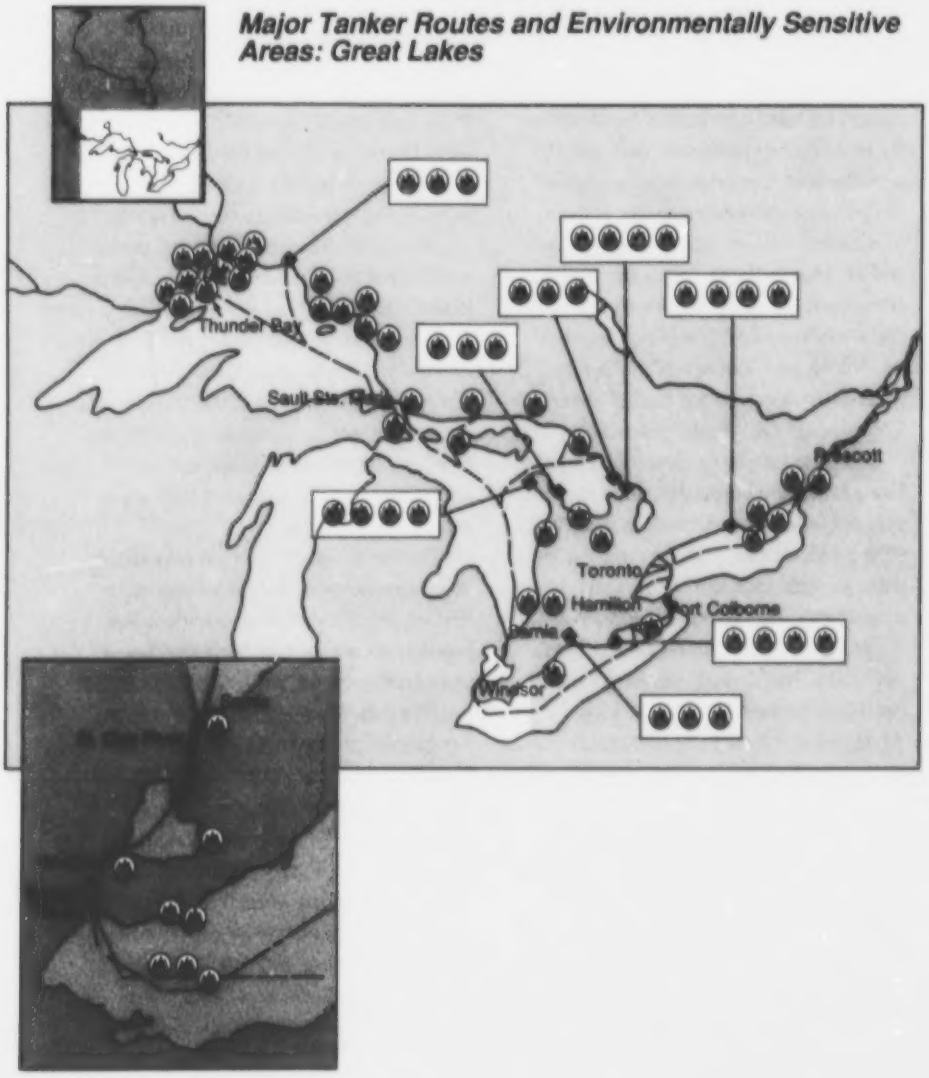
"It is crucial that the public be involved in the decisions concerning changes to the regulations as well as improving the response capability of those who are charged with carrying out those regulations. The health of the Great Lakes is the business of everyone."

Rick Coronado,
Windsor & District Labour Council

the northeast shore of Lake Erie. As for Lake Ontario, its northeast shore is home to significant numbers of Canada geese, atlantic brant and greater scaup, and Wolfe Island possesses about 46 per cent of all waterfowl in southern Ontario.

The Great Lakes are not only an indispensable source of drinking water for one out of every four Canadians, they are also of great importance for transportation, commercial fishing, industrial purposes and recreation. All of the lakes possess viable recreational and commercial fisheries. In 1989 for example, 26 356 tonnes of fish, with a market value in excess of $45 million, were landed in the Great Lakes. Prominent commercial species include yellow perch, white perch, white bass, trout, walleye, carp and sturgeon.

Major Tanker Routes and Environmentally Sensitive Areas: Great Lakes



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Environmentally sensitive areas*

Major tanker routes

* Includes coastal and marine parks, wildlife sanctuaries and conservation areas

Scientists as yet can tell us very little about the possible long-term effects on animals, plants, and people of continuous exposure to low levels of oil or other hazardous materials. What is certain, however, is that spills of these toxic materials can destroy the microscopic organisms that anchor the food chain, causing extensive damage to the ecosystem. Lake trout in the Great Lakes have been found to have a concentration level of PCBs in their tissues over 20 times greater than trout in nearby lakes.

Vessel traffic

Large volumes of petroleum and other hazardous products pass through the Great Lakes. In 1988, almost 13 million tonnes were carried by the 30 Canadian (9 million tonnes) and 4 American (3 million tonnes) tankers operating in the Great Lakes. Toxic products were also transported by 28 foreign-flag tankers, as well as 10 Canadian and 32 American barges.

The largest tanker operating in the Great Lakes is Canadian-owned and has a capacity of 19 000 tonnes. This is about 8.5 per cent of what the *Exxon Valdez* was carrying. While cargoes are smaller, the intense volume of traffic in the Great Lakes, the environmental sensitivity of the area and the fact that in some cases only natural breakdown processes can rid the lakes of most spilled toxics, means that the potential consequences of a major spill could be even more devastating.

In the "Chemical Valley" area, south of Sarnia, where 12 major petrochemical and petroleum refinery facilities border the St. Clair River, between 400 and 500 separate tanker voyages are required annually to move products to market. In 1985, in Sarnia alone, 115 tanker trips were required to move roughly 1.8 million tonnes of gasoline, jet fuel and other hazardous materials. On the Montreal-Lake Ontario section of the St. Lawrence Seaway, 300 to 400 separate voyages annually move between 2.5 and 3.2 million tonnes of materials. Further, more tonnage is handled in the Sault locks on St. Mary's River over a nine-month season than on the entire Panama Canal system in a year. The waterway is over 120 kilometres long and contains a number of extremely narrow channels in which ships run the greatest risk of grounding and subsequent spills.

The "Chemical Valley" area is of critical concern, particularly Sarnia and the St. Clair River, where traffic volumes and the swift current make this waterway extremely vulnerable. When spills occur on the river, they must be deflected to the shoreline where currents are not as strong. To do so, booms from fixed attachment points, or weighted with heavy anchors, must be used. Michigan's Office of the Great Lakes, which recently assessed the risk of hazardous spills and response capabilities in the region, expressed concern over the availability of these anchors.

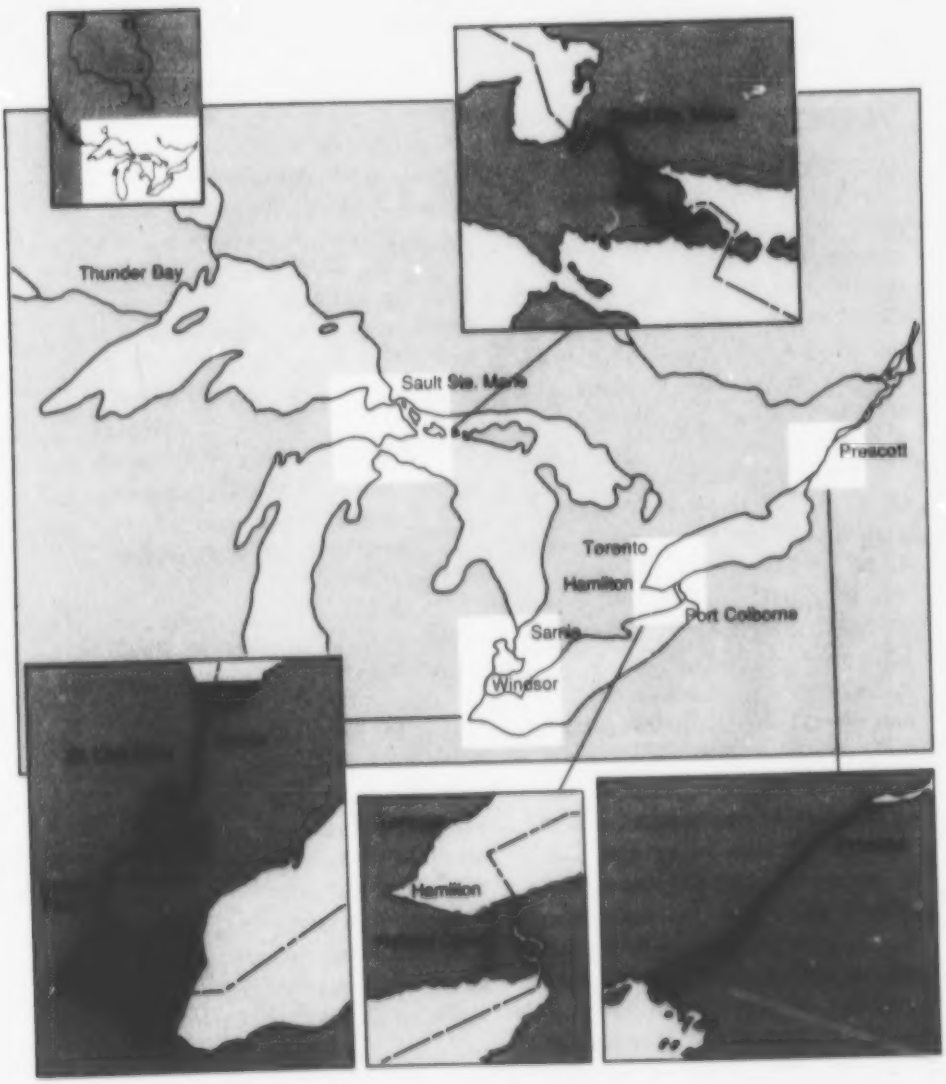
The narrow shipping lanes along St. Mary's River are also vulnerable. A major spill/clean-up effort would result in serious traffic problems as vessels entering the waterway would have to anchor and wait for operations to be completed. Problems of this sort, however, are not confined to this waterway. When the *Nepco-140* spilled 1000 tonnes of Bunker C fuel oil in the St. Lawrence River near Prescott, Ontario in 1976, navigation was suspended on the river for about 12 hours immediately following the incident. Approximately 20 ships

had to wait for passage until the possible effect of their wakes could be determined. Eventually, they were allowed to pass the partially contained oil, one at a time, but it took two days to clear the costly backlog (the direct and indirect costs of maintaining a laden tanker are between $30,000 to $50,000 a day).

Recent spills

The Great Lakes region has, so far, been spared from the effects of a catastrophic oil spill. In 1976, however, when the *Nepco-140* spill occurred, about 135 kilometres of shoreline were affected, and the four-month recovery operation cost $10 million. The incident also illus-

Pilotage Zones in Canada: Great Lakes



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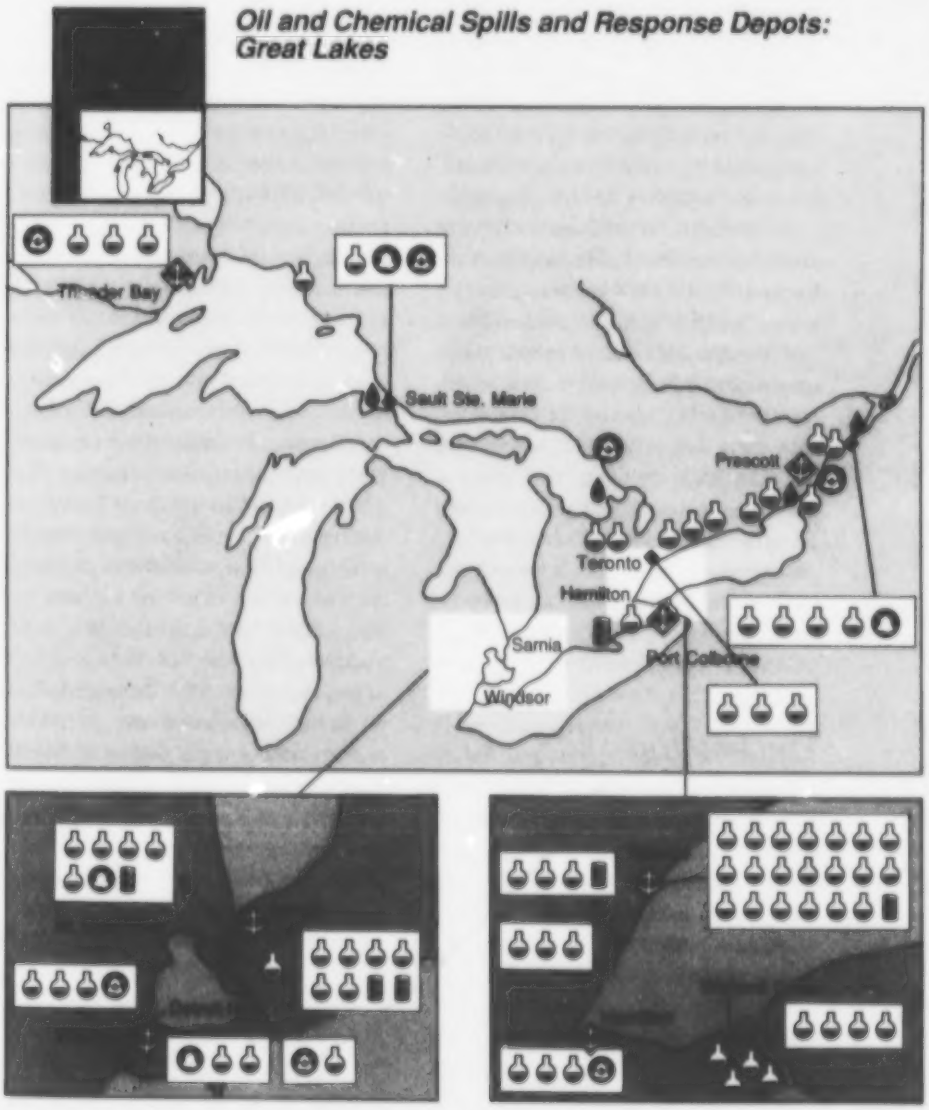
Compulsory pilotage zones

trated the clean-up problems posed by strong currents: along this waterway, currents flow at a rate of about 1.5 metres per second, making containment exceedingly difficult. Scarcely 30 hours after the *Nepco-140* spill, the oil had moved 120 kilometres downstream.

From 1972 to 1984, Environment Canada reported 275 spills along the Canadian side of the Sarnia-St. Clair River waterway. Thirty-two spills of petroleum products were 10 tonnes or more; another 15 were over 40 tonnes. In 1985-86, 110 chemical spills, with a total volume of 1300 tonnes, were reported in the area.

Oil and Chemical Spills and Response Depots: Great Lakes



In the first half of 1989, the Canadian Coast Guard reported 73 pollution sightings in the Great Lakes involving petroleum products. This led to five Coast Guard clean-up operations and another four by either the polluter or a contractor.

This said, it should be acknowledged that data on Great Lakes spills are of dubious validity because of inconsistent and incompatible reporting regimes. There are 22 different spill reporting systems, four of which are Canadian, and discrepancies between systems are often startling. Suffice it to say that the level of spills occurring in the Great Lakes is unacceptable, whatever measure is used.

Most of the chemical tankers transitting the Great Lakes range in size from 10 000 to 41 000 dead-weight tonnes. Those built to International Marine Organization (IMO) standards are special-purpose vessels with many small segregated tanks, typically in the 600- to 1600-tonne range. Each tank has its own pumping and piping systems, as well as automated heating, cooling, inerting and alarm systems. A large volume of specialty chemicals is carried in lots of 10, 20 or 40 tonnes in tank and box containers designed by the International Standards Organization (ISO).

"These tankers . . . carry very toxic chemicals. An accident with one of these tankers would be a major catastrophe, and if it happened in the fast-flowing river waters, it would be impossible to contain the spills, and these lakes would be virtually dead for a very long time."

Captain Robert Stevenson, Corporation of Professional Great Lakes Pilots

The hearings

Three days of hearings were held in Ontario: on September 25, 1989, in Sault Ste. Marie, on September 27 in Sarnia, and on September 28 in Toronto. A total of 20 groups and individuals submitted briefs — 4 in Sault Ste. Marie, 6 in Sarnia and 10 in Toronto.

The primary concern raised during the hearings was the difficulty of navigating along the often extremely confined waterways that characterize connecting channels between the lakes. This made all the more compelling certain presentations which covered the pilotage system and the regulations governing it, and underscored concerns expressed about the risks implicit in winter navigation.

Great emphasis was also placed on the unique vulnerability of the Great Lakes, due to their swift currents, heavy traffic volumes, proximity to drinking water intakes and relatively densely populated shoreline. A number of submissions focused on emergency preparedness along both sides of the Canada-U.S. border and the need for joint exercises and simulations to ensure adequate standards of operational readiness and cooperation.

In accordance with the *Transportation of Dangerous Goods Act*, all major organizations are required to have emergency response plans to deal with incidents involving the transportation of their products. There is no requirement, however, to have plans specifically for marine incidents, or to have the plans integrated with other marine spill response plans. This fact made the level of preparedness in the "Chemical Valley" all the more impressive. Industry cooperatives in the area are the best in Canada. They are constantly striving to improve their response organization and provide continuous training to employees involved in the local chemical industry. As a result, their capacity to respond to marine spills is greater than that of industry in other parts of the country.

There are eight state, one provincial and two federal environmental response agencies within the Great Lakes Basin. On the Canadian side, the lead agency for prevention and clean-up is the Coast Guard's Central Region. Of its 11 branches, the two with primary responsibility for pollution matters are Ship Safety and Marine Emergencies. The Ship Safety Branch maintains six offices in addition to its central headquarters and is responsible for the administration and enforcement of standards. The Marine Emergencies Branch responds to emergencies and generally looks after all aspects of preparedness. Many Coast Guard officers are designated as Pollution Prevention Officers and as such are empowered under the *Canada Shipping Act* to carry out inspections, take any action deemed necessary to prevent or mitigate a spill, and obtain evidence to prosecute.

Central Region maintains 12 storage depots containing pollution countermeasure equipment strategically located along the Canadian shoreline. The inventory includes seven Marine Emergency Response Team (MERT) trailers and is continually upgraded as new technologies are developed. The Central Region's operational fleet consists of 9 icebreaking and navigational aid vessels, 10 search and rescue cutters, fixed-wing aircraft and 4 helicopters. The Region also has access to the DC-3 for pollution surveillance.

In cooperation with its American counterparts, the Central Region helped to develop, and participates in, the Canada-U.S. Joint Marine Contingency Plan (CANUSLAK). Its purpose is to provide an integrated response to pollution incidents when they occur. The Canadian Coast Guard developed contingency plan supplements for five high-risk areas identified within the Great Lakes-St. Lawrence River regions, including the St. Clair River. These supplements, updated two times a year, document the information and resources available for marine pollution response. Every two years, international exercises are held to test CANUSLAK's effectiveness.

Within the contingency plans established for the Great Lakes are structures to permit various agencies at all levels to support a spill response effort. For example, the Ontario Petroleum Association, through the Petroleum Industry Marine Environmental Cooperative (PIMEC), is also capable of responding to oil spills. PIMEC is designed to respond to incidents of up to 1500 tonnes and provides for river and shoreline response. Bluewater Clean, located near Sarnia, is considered PIMEC's major training centre. The cooperative, of which all major refineries in the Sarnia area are members, coordinates the deployment of booms downstream of a spill into the fast-moving waters of the St. Clair River.

Through PIMEC, the Petroleum Association also maintains four depots, servicing 10 spill co-ops, where mobile response equipment is available for rental to non-members on a 24-hour basis. The Association also has a list of some 100 clean-up contractors, each of whom owns various amounts of equipment. Despite this seemingly impressive collection of hardware, there is much room for improvement.

The risks associated with the transportation of chemicals were noted in several submissions which also identified a lack of research into the hazards posed by chemical spills, and the inability of authorities to cope with them, as major causes for concern.

"In the space of less than two years, there have been several tanker accidents in the Great Lakes involving vessels in the domestic trade. It is just by the grace of God or good luck that there have been no great oil spills on the Great Lakes."

Captain Robert Stevenson, Corporation of Professional Great Lakes Pilots

Both the Canadian Coast Guard and The Canadian Chemical Producers' Association frankly acknowledged that they are barely equipped to deal with even a relatively minor chemical spill. While industry has been working diligently to better assess risks and enhance response capabilities, the Coast Guard has only very recently begun to give this issue priority.

Concern over the potential impact of chemical spills and the inadequacy of existing response capabilities recently encouraged a group of large Windsor-area companies to update a dormant "mutual aid" plan to be implemented in the event of a serious land-based spill in the Detroit River. At the time of the hearings, the companies, which are known as the Windsor-Essex Region Mutual Aid Spill Control Group, possessed about $4.5 million worth of clean-up equipment and were planning to spend an additional $20 million on hardware for land-based spills in 1990.

Municipalities stated that they had the right to know about the potential risks in their regions and the emergency plans that have been developed. They also stressed that they should participate in the decision-making process when spills occurred. Communities along the St. Clair River have already taken steps to prepare themselves better for chemical spills. A good co-op system has been formed with significant local involvement and direction in establishing response priorities. Training, simulations and workshops are frequently held to improve operational readiness.

Improvements in response capabilities are likely to emerge on the U.S. side of the border as well, as a result of the report submitted by the Oil Spill Preparedness Task Force to the Great Lake Governors Council in August of 1989. All of the Great Lakes states made commitments to act within their jurisdictions to anticipate and minimize environmental risks resulting from spills, and in some instances, positive steps have already been taken to achieve these objectives.

Finally, a number of people cautioned us not to ignore the already serious pollution in the Great Lakes caused by such non-tanker sources as industrial discharges from refineries, other vessels, and sewer discharges.

Recommendations

1. Navigational aids

Because the international boundary between Canada and the United States weaves its way through various portions of some very confined waterways, responsibility for safe navigation is often shared between the two countries. The Canadian Coast Guard possesses some 5600 aids to navigation within the purview of Central Region. This equipment includes buoys, day markers, foghorns, lighthouses, radio beacons, range lights and icebreaking equipment. Vessels proceeding when visibility is less than half a nautical mile rely on radar for guidance. While coverage throughout the Great Lakes region (markers/lights) is generally thorough and effective, there are some areas where additional navigational aids, or more appropriate ones, could be utilized.

The only Vessel Traffic Services (VTS) system within the Great Lakes is located at Sarnia, and regulators rely solely on VHF communications. A mobile maritime safety communications and public correspondence service is also

provided by the Coast Guard to enhance safety. Six manned radio stations extend radio coverage across the Great Lakes-St. Lawrence River system, as well as to Lake Winnipeg and Hudson Bay.

Recommendation 6-26

An assessment of the radar coverage throughout the Great Lakes be undertaken, in order to evaluate its adequacy.

In order to address the high-risk traffic on the St. Clair River-Detroit River system, special attention be paid to that area, in particular to the adequacy and reliability of markers opposite Dow Chemical's Sarnia plant and off the Stokes Point Wharf.

II. Pilotage

Since human error contributes to well over half of all reported marine accidents, we were naturally aware of the crucial importance of crew certification, training, manning levels, conditions of work and pilotage.

While these issues were always prominent in our minds during the regional hearings, we were especially interested in pilotage in the Great Lakes. Shortly after the opening of the St. Lawrence Seaway, and prior to the establishment of the Great Lakes Pilotage Authority, the Coast Guard began issuing Great Lakes Navigation Certificates (commonly referred to as B Certificates). Granted to masters of foreign-flag vessels who had made a specified number of trips through the Great Lakes over a two-year period and who spoke adequate English, these certificates exempted their vessels from compulsory pilotage requirements in certain non-designated or open waters.

Twenty-three such certificates are presently in use, and their primary purpose, it is conceded, is to reduce vessel operating costs by avoiding the need for pilots. The certificates were granted under section 562.1(1) of the *Canada Shipping Act*, which provides that the Governor in Council may " ... for the purpose of promoting safe and efficient navigation or operation of ships, or environmental protection, make regulations ... respecting the number and qualifications of navigation and engine room personnel required for duty on ships". There is no suggestion here or elsewhere in the Act that cost should be allowed to override " ... safe and efficient navigation ..."

In this regard, it is useful to note that the *Pilotage Act*, which was enacted subsequent to the *Canada Shipping Act*, defines a pilot as " ... any person not belonging to a ship who has the conduct thereof ...", and in its "Objects and Powers" requires each pilotage authority to " ... establish, operate, maintain and administer in the interests of safety, an efficient pilotage service within ... [its] region..."

It is our view that *any* certificate, waiver or exemption granted to an individual or to a vessel which in any way concerns or affects pilotage requirements should be issued exclusively by a pilotage authority.

If, nevertheless, some secondary system is to continue to exist with respect to foreign vessels, we support the recommendations of commissioner Johanne Gauthier who recently reviewed this subject and filed a report with the Minister

"This summer, when the spills occurred, my children watched the connect boats going up and down the river trying to capture the spill, and the booms, and they thought it was fun; they thought it was really exciting until they realized that they couldn't swim. Then it wasn't fun anymore."

Kristina Lee, Sarnia

of Transport. We feel that her recommendations represent a substantial improvement over the status quo, and we urge the government to accept them.

III. Year-round navigation

In recent years, the navigation season in the Great Lakes has been extended considerably, particularly between the Welland Canal and the locks at Sault Ste. Marie. As a result, both self-propelled tankers and tug-barge combinations have been operating in ice-infested waters during the winter months. The majority of these vessels are not ice-reinforced — an especially troubling fact considering that collisions with ice accounted for almost eight per cent of reported marine incidents in the Sarnia-Detroit portion of the St. Clair River last year.

When spills occur in ice-infested waters, they are infinitely more difficult to contain, particularly if they become trapped or flow beneath sheets of ice.

Recommendation 6-27

In order to reduce the risks associated with the movement of oil and chemicals through icy waters:

- *within seven years, only double-hulled, ice-reinforced tankers and barges be permitted to transport oil and chemicals through the Great Lakes system in winter months;*
- *operational guidelines concerning ice navigation conditions be developed;*
- *a review of tank barge operations in ice conditions on the Great Lakes be conducted in cooperation with the U.S., with a view to establishing rigorous operational guidelines that emphasize safety and environmental protection.*

". . . we fully endorse the . . . demand for double-bottomed and double-hulled tankers . . . fitted as necessary for Great Lakes navigation with bow thrusters."

Rick Coronado, Windsor & District Labour Council

IV. Keel clearance

Statistical evidence on Great Lakes accidents demonstrates clearly that groundings on shallow waterways have an appreciably higher rate of occurrence than any other type of accidents.

Recommendation 6-28

To avoid groundings in established channels, the Coast Guard decide on a minimum keel clearance for vessels transiting the Great Lakes waterways.

V. Charts and data gathering

Both Canada and the United States have numerous organizations whose function it is to develop guidelines for spill prevention and contingency planning. However, the lack of standardized scales, symbols and measures unnecessarily compounds the risk of navigational errors by pilots and shipmasters — particularly for foreign vessels. In the Great Lakes Basin alone, there are 22 spill reporting systems. Both these and emergency response triggering thresholds vary widely between, and often within, jurisdictions, making monitoring difficult and response processes inconsistent.

Maps outlining critical fish and wildlife habitats and drinking water intakes, which could be used to alert those likely to be called upon to respond to incidents and to warn populations who may be at risk, have yet to be sufficiently developed. The Fisheries and Habitat Management division of the Department of Fisheries and Oceans, in conjunction with Environment Canada and Ontario's Ministry of Natural Resources, is currently in the process of mapping

critical fish habitat throughout the Great Lakes coastal areas. When integrated with other kinds of information already available, this will improve the ability to anticipate the impact of spills and establish clean-up priorities.

Remedial efforts are required in a broad range of information gathering mechanisms relevant to spill prevention, preparedness and policy. Some commendable progress has been made provincially in this regard. A provision in Ontario's *Environmental Protection Act* directs police, fire and municipal departments to notify the Spill Action Centre of any incident they have reason to believe has not been reported. The Centre operates a 24-hour emergency hotline and is responsible for data collection and organization.

Recommendation 6-29

In order to reduce the risk of accidents resulting from, or being exacerbated by, misinterpretation of information, the Canadian government work with the Ontario and American governments to:

- *standardize spill reporting regimes, notification triggering criteria, charts, scales and measures used on the Great Lakes-St. Lawrence Seaway system;*
- *develop maps indicating wildlife and fish habitats, sensitive marshland and drinking water intakes.*

VI. Drinking water intakes

Several people raised concerns over the vulnerability of drinking water intakes to spills of hazardous materials, both in the Great Lakes and St. Lawrence River regions. Clearly, their presence must be taken into account when considering contingency plans of any sort in the Great Lakes. It is imperative that systems be developed to provide those responsible for these intakes with the maximum possible lead time to shut them down and access other sources at the first sign of trouble.

Recommendation 6-30

In order to safeguard drinking water supplies:

- *priority be given in all contingency plans to notifying managers of water treatment facilities of any incident or potential incident that may affect their operations;*
- *the locations of drinking water intakes, and contact numbers for their operators and onshore response personnel, be clearly identified on maps and charts provided to vessels transitting the Great Lakes-St. Lawrence River system;*
- *spill response equipment, appropriate to the nature of the risk and the currents of the relevant waterway or channel, be stockpiled within the vicinity of, and upstream from, drinking water intakes.*

VII. Use of dispersants

To be effective, most oil spill dispersants require a minimum level of surface water agitation. The relatively low waves which characterize the Great Lakes make their use problematic. It should also be noted that, to date, no freshwater dispersants have been developed for commercial use. Despite this, we have heard reports of unscrupulous individuals urging municipal officials to purchase chemical dispersants so as to be prepared for potential marine spill incidents.

Recommendation 6-31

In order to protect the quality of drinking water, no chemical dispersants be authorized for use on Great Lakes spills until proven to be safe and effective. Moreover, municipalities must be made aware of the ban and the reasons for it.

VIII. Enforcement and penalties

Throughout this report, we emphasize the need for regulatory agencies to police existing enforcement regimes more effectively and pursue non-complying vessels more aggressively. We were thus disheartened to discover that, despite the Great Lakes region possessing the only dedicated surveillance aircraft used for pollution control, over a three-year period, only two prosecutions were attempted in 83 incidents studied by the Coast Guard's Central Region.

The reasons for this dubious record are numerous. Ship inspectors, on average, are not familiar with legal processes, and incident reporting systems are awkward and lead to unacceptable delays in communicating pertinent information. These difficulties can, and must, be overcome; only through aggressive enforcement based on vigilance will improvements occur.

Given that 43.4 per cent of the marine spills that occur in the Great Lakes originate from Canadian-flag vessels, as opposed to 2.4 per cent from American vessels and 7.2 per cent from other foreign vessels, stricter enforcement is definitely in order.

IX. Ballast water discharges

The discovery of three new non-native species of marine life in the Great Lakes greatly concerned marine biologists, as well as federal, provincial and municipal authorities. One of the new species, the zebra mussel, blocks industrial and drinking water inlets and outlets. Another, a predacious planktonic cladoceran, has the potential to reduce the food supply on which certain fish species thrive. The third, the European river ruffe, has been responsible for drastic declines in commercial fisheries in Scotland and the Soviet Union.

According to an Environment Canada study, these foreign organisms were likely introduced into the Great Lakes by ballast water discharges from foreign vessels. The problem is not unique to Canada: in 1989, Australia introduced regulations to control ballast water discharges when similar problems appeared in its waters. These regulations were subsequently withdrawn in favour of ballast-control guidelines.

In 1989, Canada also established a set of exchange guidelines in consultation with the Great Lakes Fishery Commission, the Canadian Shipowners Association, the Shipping Federation of Canada, the St. Lawrence Seaway Authority, the Canada Ports Corporation and other federal departments.

While this issue is not strictly within our mandate, we would be remiss were we not to make reference to its significance. Recommendations that we have made elsewhere in this report regarding mandatory use of waste-water reception facilities would help to remedy this problem.

The
Arctic

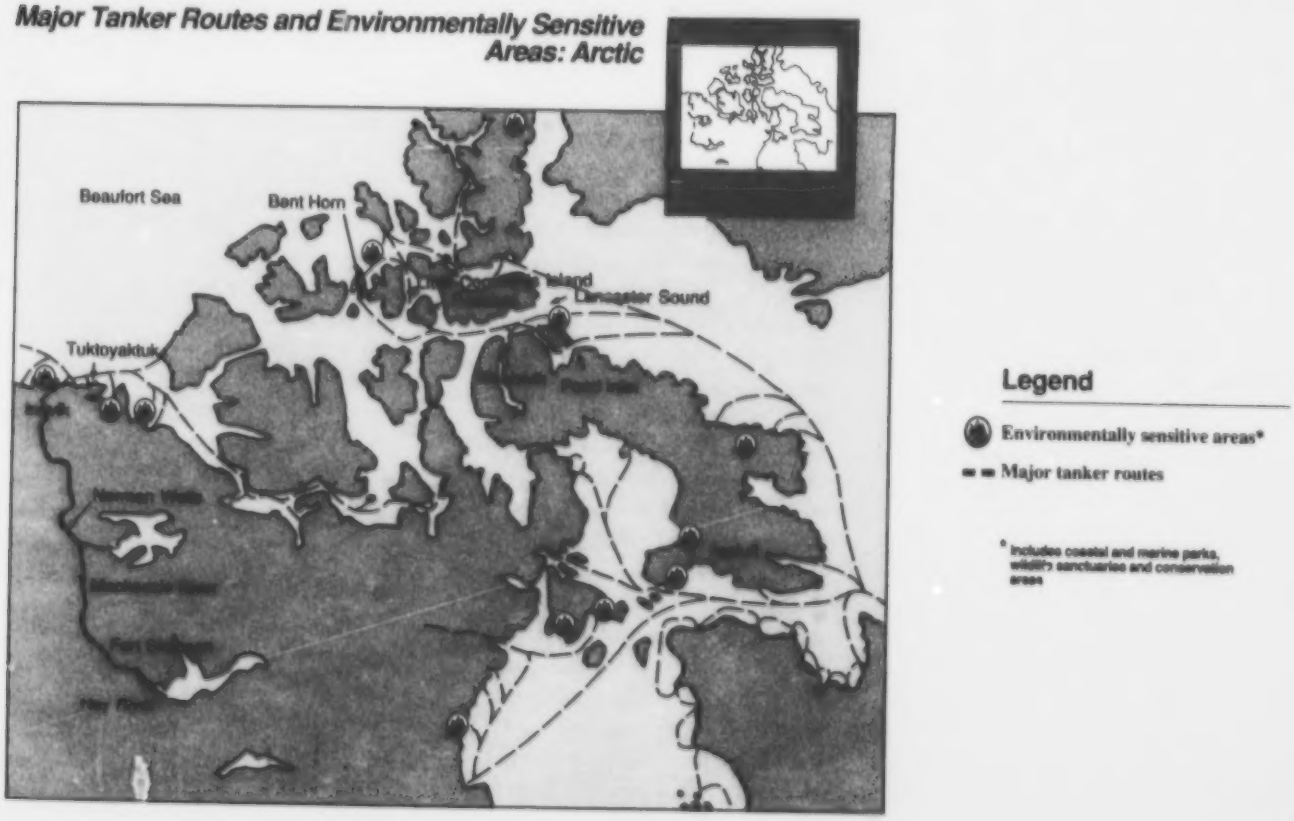
Special features of the region

Two thirds of Canada's coastline is in the Arctic, but only a fraction of the oil transported in or near Canadian waters crosses the Arctic Circle. Nevertheless, the preservation of the fragile Arctic environment is of special importance to the native population, northerners and indeed, all Canadians.

The North is very sparsely populated. Distances between communities are considerable and access by road is virtually non-existent or, at best, seasonal. Arctic waters and the shoreline are ice-covered much of the year, and the High Arctic is enveloped in total darkness for three months of the year.

The Arctic region presents many hazards and hindrances to oil spill clean-up. Rocky shorelines and largely uncharted waters make most areas inaccessible, and the cold climate and ice slow the biological and physical processes which disperse and decompose oil. Working conditions are also difficult at the best of times. Accommodation for large numbers of clean-up workers does not exist and a massive influx of volunteers would overwhelm most — if not all — Arctic communities. Moreover, suitable runways to handle oil-spill-equipment-bearing Hercules aircraft are few and far between, assuming the

Major Tanker Routes and Environmentally Sensitive Areas: Arctic



"It is our contention that this particular area cannot handle an oil spill of any kind. And I don't know how you're going to get the oil to somewhere else; perhaps through a pipeline, or via an alternate route. It's just that no risk, in our opinion, is acceptable in this particular region."

Duncan Cunningham,
Baffin Region Inuit Association (BRIA)

planes are available and weather permits flying. The Canadian Coast Guard's main oil spill equipment depot for the eastern Arctic is in St. John's, Newfoundland.

Any area of the Arctic where natives hunt, trap and fish would be especially vulnerable to an oil spill. Lancaster Sound and the Beaufort Sea are perhaps the most vulnerable. Lancaster Sound, in the eastern Arctic, at the entrance to the Northwest Passage, is an extremely productive area in biological terms. Eighty-five per cent of North America's narwhal, 40 per cent of the belugas, large seal populations, walrus colonies and millions of seabirds congregate there at certain times of the year. For this reason, the five Inuit communities in the area are extremely worried about all shipping activity, but especially tanker traffic. They are concerned about ship noise, ship tracks and oil spills, as well as the effects that any one of these may have on marine mammal migration routes, Inuit ice routes and wildlife harvesting activities. Besides more consultation on shipping activities, they would like to see year-round crude shipments prohibited.

At the other end of the Passage, in the Beaufort Sea, the shallow coastal waters are a migratory habitat for millions of birds, including snow geese, which stop over on the Pacific Flyway. The area is also the prime denning habitat for polar bears and red and Arctic fox, as well as a hunting ground for wolves. The porcupine caribou herd ranges along the coast and uses the seashore, as well as marshy areas of the Yukon near the Alaskan border and the mouth of the Firth River. One fifth of the world's tundra swan population also lives in the area. Of all the wildlife in the Arctic, however, the bowhead whale is unarguably the most vulnerable to spills: if crude oil were to block the whale's access to open leads for breathing purposes, the whale would drown or suffocate beneath the pack ice.

Why, then, one might ask, is there any oil transport at all in the Arctic? The answer is two-fold: oil companies want to ship crude out and coastal communities need to have petroleum products shipped in for heating and other needs. But to the Inuit of the Canadian Arctic, the waters of the coastal environment are as important as the land. Indeed, for many months of the year, while coastal waters are ice-covered, the two are virtually indistinguishable.

The health and welfare of the Inuit depend on the health and welfare of the polar bears they hunt, the seals they shoot, the fish they catch and the whales they eat. Anything that might disrupt this intricate ecosystem — be it the effect of ship tracks on migration routes or the effect of spilled oil on seabirds, marine mammals and even the porcupine caribou — could have a devastating effect on aboriginal culture.

For the foreseeable future, Arctic communities will continue to depend upon fuel resupply by tanker and barge. The big question is, therefore, whether native groups will be able to withstand the pressure to develop petroleum resources before adequate safety measures are in place. If not, they could conceivably lose their source of food and way of life.

Vessel traffic

Tanker and barge traffic in the Canadian North is significant, but seasonal. During the open-water season, up to a dozen tankers operate in the eastern Arctic, while approximately 80 barges deliver petroleum products in Hudson Bay, the central and western Arctic, as well as

along the Mackenzie River and Great Slave Lake. Tankers and barges are the principal means of supplying northern communities with heavy goods and bulk petroleum, including fuel for home heating, power plants and transport. Each year, there are also limited shipments of crude oil and even fewer shipments of chemicals.

Eastern Arctic sealift

The annual fuel resupply operation in the eastern Arctic typically involves 10 tankers, each between 6000 and 12 000 tonnes. Some 50 sites are served during the two- to three-month shipping season (July through September). The tankers are all ice-strengthened, but none have double hulls, and some are over 20 years old. Four or five of these tankers are chartered by the Canadian Coast Guard, whose six icebreakers provide escort and support; the rest are chartered privately. Approximately 200 000 tonnes of diesel fuel, aviation fuel and heating oil are shipped each year, and an additional 100 000 tonnes of propulsion fuel are carried aboard the tankers, icebreakers and dry-cargo vessels operating in the eastern Arctic.

Only two or three of the 50 communities served have oil spill response equipment depots. Few of the tankers currently carry any form of equipment and only three of the icebreakers do, including 900 metres of boom. Moreover, since few Arctic communities have docks, fuel has to be offloaded using hoses connected from ships to shore facilities.

The annual Arctic fuel resupply is becoming increasingly privatized for economic and other reasons. We are somewhat concerned by this development, because coordination and safety may well suffer if the Coast Guard no longer organizes the sealift or does an on-hire survey.

Petroleum barge traffic

Over 80 barges deliver petroleum products in the North in any given year. With its 75 barges, Northern Transportation Company Limited (NTCL) is by far the largest operator. There are, however, some independent operators in the Mackenzie Delta area, including Arctic Transportation Limited, which supplies barges to the offshore drilling industry. In the James Bay area, Moosonee Transport manages the resupply of seven communities, using two tugs and four barges. In 1988, the company delivered 5300 tonnes of petroleum products.

NTCL is the major supplier of bulk petroleum products along the Mackenzie River and Great Slave Lake, as well as in the western and central Arctic. In 1989, the company shipped a total of 179 000 tonnes of petroleum to those areas — all of it down the Mackenzie. Of the 90 000 tonnes delivered to 13 sites between Hay River and Inuvik, fully one half went across Great Slave Lake, from Hay River to Yellowknife. The remainder (89 000 tonnes), was shipped along the coast, destined for 13 sites between Herschel Island and Spence Bay, 6 Keewatin communities, 8 North Warning System construction sites, and 13 operational DEW Line sites.

NTCL's oil barges are all built to carry petroleum below deck and dry cargo on deck. They range from 600 to 1800 tonnes, with two thirds of them in the 1000- to 1500-tonne range. None are double-hulled, but they are all compartmentalized. They are pushed by high-powered tugs in trains of six to 10 barges. NTCL and Lloyd's inspect the

"We sit on pins and needles all the time. We fear an oil blowout from an offshore rig on the Beaufort or the grounding of a tanker."

Norma Kassi,
Gwich'in Steering Committee

barges each year, but as barges are not covered under the *Canada Shipping Act*, except for load-line requirements, they are not inspected by the Canadian Coast Guard.

NTCL has oil spill response craft at Hay River, Inuvik and Tuktoyaktuk. It also has oil spill containment and clean-up equipment and supplies at these locations, as well as at Norman Wells and Fort Simpson. The inventory normally includes booms and skimmers. It costs NTCL $12,000 per year to maintain $500,000 of clean-up equipment. Barge pollution packages (containing booms, sorbent pads and other equipment) are also used aboard NTCL vessels. Esso, Interprovincial Pipe Line and the Coast Guard all maintain equipment at Norman Wells, and the Coast Guard has equipment at Hay River and Tuktoyaktuk. The Beaufort Sea Cooperative also has an impressive array of equipment at Tuktoyaktuk. Nine communities, however, apparently have no equipment whatsoever. NTCL has an oil spill contingency plan for the Mackenzie River and the western Arctic. Portions of it were updated in May 1988, but the Beaufort Sea portion is seven years old.

Arctic Transportation Limited also has an oil spill response barge at Tuktoyaktuk. It is not in active service, but may be suitable for use in the eastern Arctic, where most of the tankers operate. The barge has a helicopter pad and accommodation facilities, and could also be used to offload oil or debris from stricken vessels.

Crude oil shipments by tanker

Since 1985, a total of 170 000 tonnes of crude oil has come out of the Arctic aboard tankers. Aside from one shipment by the *Gulf Beaufort* from the Amauligak field around Alaska in 1986, all of this production has been from Panarctic's Bent Horn field on Cameron Island in Zone 1, northwest of Resolute.

Each summer since 1985, the 28 000-tonne, double-hulled *M.V. Arctic* has taken one or two shipments of light crude oil from Bent Horn for transshipment to smaller tankers. The *M.VArctic* is an Arctic Class 4 Oil Bulk Ore carrier, which is owned by Canarctic Shipping and chartered by Panarctic for the Bent Horn shipments. The Government of Canada owns 51 per cent of Canarctic and Petro-Canada has a majority interest in Panarctic.

During the very limited shipping window for Zone 1, the *M.V. Arctic* enters the zone under Coast Guard icebreaker escort, picks up the crude from the onshore storage tank, and leaves the zone. It then transfers its cargo to smaller tankers (at locations which vary from year to year), for shipment either to Montreal or Europe. This process is then repeated. In addition, each year a smaller tanker delivers some of the light crude from Bent Horn to Resolute Bay, where it is used by Northern Canada Power Corporation. Sometimes crude is also delivered to the Polaris mine on Little Cornwallis Island.

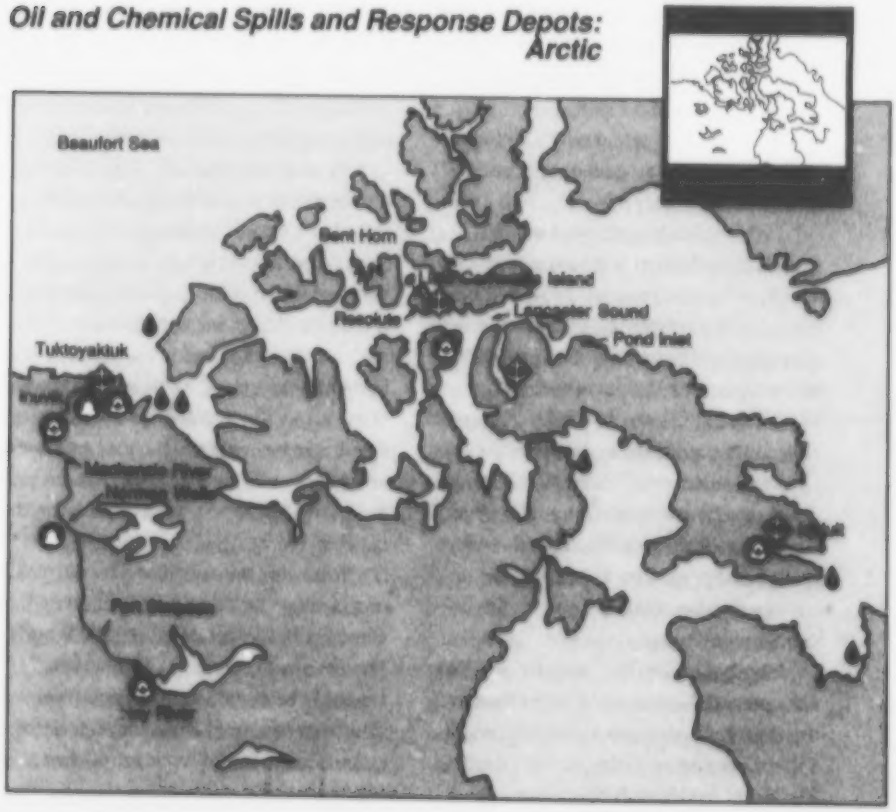
Recent spills

Many spills have occurred in the Arctic in the past two decades. In June 1970, 1500 tonnes of Arctic diesel oil and gasoline were spilled in Deception Bay in Hudson Strait. In August of the same year, 14 tonnes of fuel oil were spilled into Resolute Harbour, contaminating about 1.8 kilometres of intertidal zone. Between 1974 and 1978, there were 10 spills in the eastern Arctic, each in excess of 2.5 tonnes. The largest of these involved more than 2000 tonnes of diesel fuel.

In September 1980, the cargo vessel *Edgar Jourdain* went aground off Hall Beach, spilling 50 000 litres of marine diesel fuel. Within a week or so, ice cover emerged and the remaining fuel in the vessel froze. The following spring, after an extended exchange between the Coast Guard and Environment Canada, the remaining oil was burned off. By December 1982, the *Edgar Jourdain* had disappeared without a trace.

Between 1981 and 1989, a total of 121 incidents were reported. In September 1985, *Le Chêne N° 1* spilled 87 tonnes of aviation fuel into the sea, resulting in a $14,000 fine for its Canadian owner. The fuel came from a floating hose that ruptured during the night while unattended.

Oil and Chemical Spills and Response Depots: Arctic



Legend

- Major port
- Past oil and chemical spills
- Industry spill response depot
- Government spill response depot

Spills from storage tanks are also quite common in the Arctic, and another allegedly frequent source of spills is bilge water pumping, which occurs because there are currently no onshore bilge reception facilities.

Previous reviews

Several environmental assessment panels have looked into hydrocarbon shipments in the North. There have been three reviews in the past decade and, while each of them dealt with either specific areas or development proposals, many of the recommendations that resulted continue to be relevant and instructive.

In 1979, the Lancaster Sound Drilling Report recommended that a decision on exploration in the Sound be deferred until such time as a land-use plan for the region could be developed. That has recently been completed, and we comment on the plan's shipping recommendations later in this report.

The following year, the Arctic Pilot Project Final Report was issued. That study reviewed a proposal to ship liquefied natural gas from the High Arctic in special-purpose carriers. The project never went ahead because of financial obstacles, but the report did give the go-ahead to the shipping component, subject to certain restrictions. It called for extensive research and monitoring, as well as for the establishment of a control authority to monitor ship movements and enforce good seamanship and environmental regulations.

Finally, in 1984 the Beaufort Sea Environmental Assessment Panel released its report on hydrocarbon development and transportation in the western Arctic. The Panel tended to favour an overland pipeline route for transport of oil and gas from the Beaufort Sea-Mackenzie Delta region. The use of tankers, however, was not completely ruled out. Tankers could only be used through the Northwest Passage if a government research and preparation stage had been completed, followed by completion of an experimental stage involving two Class 10 supertankers. The Panel called for a phased approach to development with a number of small projects rather than one megaproject.

Six years have passed since the Beaufort Sea Panel report was released and there have been a number of significant developments in the Arctic in that time, including implementation of the western Arctic land claim. The offshore hydrocarbon development that was anticipated at the time the Panel was formed has not yet occurred, owing mainly to disappointing drilling results and the collapse of the world price for crude oil. These factors make it awkward for us to evaluate the extent to which the recommendations have been implemented. A close look at the report reveals, however, that many of the recommendations concerning tanker traffic were general in nature; they were not restricted to any one development proposal, or conditional on there being a specific development proposal. For this reason, we believe that a detailed assessment of how the recommendations from the 1984 report were implemented is called for.

Following a detailed review of proposals to ship crude oil from the Beaufort Sea in supertankers, the Beaufort Sea Panel concluded that such tankers could be constructed to appropriate standards of safety. However, it felt that other issues were of more immediate and serious concern, namely:

- the effects of shipping on wildlife, including the effects of noise, physical injury from passing tankers, and human (tanker) presence;
- the fact that tanker courses, in cerain seasons, would intersect Inuit cross-ice travel routes;
- the possibility of tankers affecting break-up timing by opening artificial leads in the ice, thus also affecting wildlife migration patterns and local climate; and
- spill countermeasures in Arctic conditions.

These fundamental issues were raised frequently by northerners at the Beaufort Sea Panel's hearings, and they add to our own concerns about tanker safety and the risk of spills.

In response to these concerns, the Beaufort Sea Panel laid down extensive research and preparation requirements for the phased tanker option. The Panel recommended a 15-year program of accelerated Arctic research. Baseline data was to be gathered and long-term research done on the basic physical and biological processes of the northern environment, so that the impact of development could be assessed.

Although a 15-year program has not been established, a number of programs have led to considerable research in preparation for possible marine transport of hydrocarbons. The vehicle for much of this research was the Northern Oil and Gas Action Program (NOGAP), initiated in 1984 as a seven-year, $110 million program. However, NOGAP was a victim of budget cuts that same year and was discontinued in 1988. Only recently has it been revived, with a two-year, $8.5 million budget. A number of useful studies, such as beluga and bowhead distribution studies have been conducted under NOGAP, but this is only a small fraction of what was called for. The program should be continued as long as gaps in our scientific knowledge persist.

In terms of marine transport research, a total of $20 million has been spent since the late seventies by government and industry on ship-ice interaction and Arctic ice conditions. In 1985, a government-industry committee was formed to review the research results and propose revisions to the Canadian Arctic Shipping Pollution Prevention Regulations (CASPPR). In March 1990, the committee released its main findings, which include a comprehensive overhaul of CASPPR. Among the proposed changes are a new ship-categorization system, a more realistic and flexible ice zone system, more stringent structural design requirements, and a requirement to separate pollutants from the outer shell. If implemented, these changes might extend the Arctic shipping season, while reducing the risk of accidental spills.

Arctic research is also funded through the Environmental Studies Research Funds (ESRF). A high percentage of ESRF studies, particularly those undertaken in the mid-eighties, have related to Arctic oil spills and/or icebergs. Priorities for future oil spill research to be financed by the ESRF are presently being reviewed.

The Arctic and Marine Oil Spill Program (AMOP) has also been a useful vehicle for research. Unfortunately, its budget has been cut drastically in recent years. Finally, the Panel on Energy Research and Development has done considerable research relevant to oil spills.

"Nunatsiaq to us would mean 'the beautiful land'. But more in terms of the Inuit, in Inuktitut it means 'the good land' because it takes care of us, and I think that's exactly how we feel about the North."

Jack Anawak, M.P. (Nunatsiaq)

The Beaufort Sea Panel also made a number of specific statements in areas which fall under our mandate. For instance, that Panel highlighted the need for strict standards on shipping and for improvements in oil-spill-trajectory models. Progress has been made on both of these fronts. The Panel also called for completion of land-use plans in the Arctic — an exercise that is virtually completed in the eastern Arctic, but is less advanced in the western Arctic.

Sensitivity mapping for shipping routes was also recommended. We are pleased to note that Environment Canada has prepared an excellent environmental atlas for the Beaufort region and is completing another one for Lancaster Sound. We recommend that an atlas be produced for the Mackenzie River as well.

The Beaufort Sea Panel stipulated as well that government must establish response capability standards, in terms of the minimum amount of oil which can be recovered per day from a blowout, within a specified time, before help from other regions is called for. It was also recommended that navigation, communication, weather, and ice and hazard detection systems be in place, and hydrographic charting be completed, before transportation of oil by any tanker is permitted. The deficiencies these recommendations address remain as urgent today as they were in 1984.

Due to the hazardous nature of shipping in the Arctic and, in particular, the presence of icebergs and poor weather, the Panel would have preferred that the standards that applied to crude oil shipments also apply to community resupply tankers. It did not, however, want to unduly disrupt the annual sealift. Thus, while it proposed that all crude oil be shipped in vessels that met design and operating standards similar to those of the proponents in the Beaufort, it suggested that the whole issue of summer shipping be reviewed.

The Beaufort Sea Panel also recommended that one agency, the Canadian Coast Guard, be responsible for oil spill contingency planning in the Arctic, whatever the source of the oil. We note, however, that the Department of Indian Affairs and Northern Development (DIAND) has its own Arctic Seas Strategy, through which it intends to coordinate all operational plans, the Coast Guard has its Arctic Marine Emergencies Plan for marine spills, the Canada Oil and Gas Lands Administration (COGLA) has a plan for hydrocarbon exploration and development spills, and the Department of Fisheries and Oceans has a plan as well. The proliferation of these plans would appear to engender confusion and duplication of effort.

The establishment of a consultative mechanism involving all government agencies responsible for marine environmental management and protection throughout the Arctic was also recommended in the Beaufort Sea Panel's report. We note with satisfaction that the Arctic Regional Environmental Emergency Team meets this requirement.

Cooperation between international agencies on Arctic contingency plans was also considered essential. The Canada-United States Oil Spill Contingency Plan has an annex extending it to the Beaufort, but we have heard little evidence of regular training exercises. Canada has a Marine Environmental Cooperation Agreement with Denmark and Greenland, but a serious oil spill contingency plan has yet to be developed with the latter. In November 1989, a Canada-USSR Memorandum of Understanding was signed on oil spill coopera-

tion in the Arctic. This agreement calls for sharing of information and experience on oil spills, the transfer of technology, joint response, and the sending of experts to observe spills in ice-covered waters.

A recent initiative by Finland relating to the protection of the Arctic environment includes an oil spill cooperation component, and this is to be encouraged.

The Beaufort Sea Panel also recommended that the Canadian Coast Guard be empowered "to direct shipping away from, or issue instructions for the safe operation of vessels within, specific areas, at times or locations of environmental sensitivity." Six years later, the Coast Guard still does not have this power. We recommend that it be granted.

The Panel proposed that NORDREG, the vessel traffic management system for the Arctic, be made mandatory. We concur that it should be mandatory and recommend that it be done.

Another recommendation was that the federal government immediately commence the construction of an icebreaker that would at least meet Arctic Class 8 specifications. Unfortunately, plans to build a *Polar 8* icebreaker have been scrapped. The *Polar 8* was central to the research and spill response recommendations of the Beaufort Sea Panel.

The Panel recommended that DIAND prepare for small-scale, phased energy projects, not only for the Beaufort, but for other regions of the Arctic as well. DIAND responded in the Beaufort with the Northern Oil and Gas Action Program (NOGAP), but aside from Bent Horn there has been no oil and gas action, at least in terms of production. As we ourselves would prefer to see no offshore crude oil production from the Arctic, we obviously see no need to prepare for it.

The Minister of the Environment was advised to have the issue of tanker traffic in the Labrador Sea reviewed either by a public review panel or at a conference. This recommendation was implemented, we are pleased to say, when the Environmental Advisory Committee on Arctic and Labrador Marine Transport released its report in November 1989.

That Beaufort Sea Panel urged all parties, including the federal and territorial governments and native groups, to resolve outstanding aboriginal claims as soon as possible. Much progress has been made in this area, with the Inuvialuit Final Agreement in the western Arctic (1984), the agreement in principle on the Nunavut land claim in the eastern Arctic, announced in March 1990, and similar agreements with the Council of Yukon Indians and Dene-Métis in April 1990. Under each of these arrangements, natives will have a substantial say as to whether hydrocarbon activity proceeds in their region, and under what terms and conditions. The principal means for assuring native input will be through the environmental screening and review procedures set out in the land claim settlements. These agreements also have extensive provisions regarding compensation.

The last recommendation made by the Beaufort Sea Panel required DIAND to publish a yearly report describing the progress made in addressing recommendations, or the reason why the recommendations were not accepted. While DIAND did respond to the Panel's report in 1985 and conducted an internal study of the implementation of its recommendations in 1988, yearly reports have not been published.

"The government tells us that today you can still eat your food, like seal, whales, sea mammals. If we don't protect our environment, the government will tell us — tell me — 'I'm sorry, you cannot eat your country's food anymore. You have to stop eating those.' Then my culture will no longer exist."

Ludy Pudluk,
Mayor of Resolute

The hearings

We made two trips to the North, visiting a total of six communities. We started by visiting two communities on Baffin Island — Iqaluit (September 11), and Pond Inlet (September 12). In Iqaluit, we met with representatives of the native population, who are struggling to maintain their culture in an increasingly industrialized and polluted world. We were also extensively briefed by Coast Guard Northern. In Pond Inlet, near the entrance to Lancaster Sound, we listened to natives who are concerned about the possible negative effects of oil and gas shipping activity in the region, which is very rich biologically. Most of the shipping currently consists of community fuel resupply, but there are one or two shipments of crude from Bent Horn as well. A land-use plan is being finalized for the region and it contains significant provisions on shipping, on which we will comment later. Agreement in principle has also been reached on the Nunavut land claim in the eastern Arctic.

From Baffin Island we moved on to Resolute in the Northwest Passage (September 13). Resolute is the main staging area for several types of High Arctic activities, and there we heard from local people and shipping officials as well. Our last stop on our first visit to the Arctic was Inuvik, the largest town in the western Arctic, on the edge of the Beaufort Sea. Here, the Inuvialuit have already settled their land claim, but they are still concerned about the impact of oil and gas development offshore. They would prefer to see a pipeline rather than a tanker route, because they are afraid that a massive oil spill, such as that from the *Exxon Valdez*, would essentially wipe out their culture. Their main concern is the prevention of such a spill; however, if one *does occur* they want to be fully compensated from a special $120 million oil spill fund. The source of the fund would be a levy imposed on pipeline and tanker shipments, with a lower rate for pipeline shipments so as to discourage shipment by tanker.

While in Inuvik, we also heard from the industry oil spill cooperative, which is one of the best equipped and trained in the country. Unfortunately, poor weather prevented us from visiting Tuktoyaktuk, where most of the oil spill clean-up equipment is located.

In November we returned to the North, visiting Norman Wells (November 23) and Whitehorse (November 27). Norman Wells is the site of the oldest northern oil production in Canada, and we talked with the oil company's spill clean-up personnel, as well as with barge operators and community representatives. We were impressed by the quality of all the briefs received at Norman Wells, and we now fully appreciate that the Mackenzie River is a special case for barge transport.

In Whitehorse (November 27), the participants at the hearings ranged from Ports Canada to the MLA for Old Crow, who spoke with passion about native concerns for the preservation of their way of life. The Yukon government and two environmental groups also addressed us. The major concern in the Yukon is possible tanker traffic in the Beaufort Sea. Yukoners see few benefits, but several threats to wildlife.

People in the North generally are deeply concerned about the threat of oil spills to their fragile environment, which they, along with other Canadians, treasure. Current levels of tanker traffic are modest, but the majority of the people

"The common statement we have from our masters is that they're into a storm for several hours and then they get the forecast that it's going to appear."

Paul Prevel,
Northern Transportation Company Limited

with whom we met are concerned about the prospect of year-round shipments of crude oil through the Northwest Passage. They wonder, as do we, about the Government of Canada's ability to prevent foreign tankers from using the Passage, as well as the ability to clean up spills resulting from existing domestic traffic. For these reasons, we place a special premium on prevention in the Arctic. Nobody wants an *Exxon Valdez* disaster to occur in the Canadian North.

With respect to marine environmental legislation, a special legal regime exists for the Arctic in the form of the *Arctic Waters Pollution Prevention Act*. Elsewhere in this report we recommend improvements to that Act. In the following pages, we make a total of 11 recommendations which we firmly believe will create a special, comprehensive, oil spill prevention and preparedness regime for the Arctic.

Recommendations

We are proposing a comprehensive set of measures geared to the special circumstances of the Arctic. Reflecting the heightened need for vigilance in the Arctic, most of these recommendations are preventive in nature. Nevertheless, the ones that deal with preparedness are viewed as equally crucial.

i. Shipments of crude oil from the Arctic

It is sometimes argued that because commercial shipping in the Arctic takes place only during the open-water season, it is really just an extension of the southern Canadian shipping season. We do not share this view; but, even if the statement were true, it fails to take into account the catastrophic damage a spill could inflict on this delicately balanced ecosystem.

It has also been argued that, by imposing stringent design standards and operation conditions on Arctic tankers, one can actually make navigation there safer than in southern waters. We would like to make it at least equally safe.

The evidence put before us leads us to believe that the human factor takes on particular importance in the Arctic. Accidents are more likely to occur there because operating conditions are very harsh and crews work long hours with no home or shore leave. Because communities depend on the sealift and there is open water for such a short time, there is pressure to take risks.

Tanker traffic in the Arctic appears to run the greatest risk when vessels are travelling in transit at speed and when oil is being offloaded. Vessels in transit run the risk of having their hulls punctured by multi-year ice. If that occurs, the damage could be catastrophic. When offloading, the risk may be greater, but the volumes spilled are likely to be smaller.

This leads us to the conclusion that the best way to minimize risks in the Arctic is to prohibit crude oil tanker traffic completely. As for community fuel resupply traffic, it should be kept to an absolute minimum.

Because it takes a long time for substances to biodegrade in the Arctic, the whole region can be considered sensitive. The presence of ice most of the year compounds the problem. Wildlife populations in the Arctic often cluster together at certain times of the year, for instance, during spring or fall migrations or the open-water season. This means that at times an oil spill could put an entire wildlife population at risk, including seabirds, polar bears and whales. This risk has special significance for endangered species such as the bowhead whale or

"We who have been raised in this environment know all too well the hardships that can be encountered during adverse weather conditions. We also know the possible devastating effects of a large oil spill on the food chain which supports our traditional way of life. These natural resources are essential for the continuation of a unique relationship we have with this environment."

Bill Byrne,
Shihta Regional Council,
Norman Wells

Eskimo curlew. Even the inland porcupine caribou herd could be affected by a spill if it occurred in July, when the caribou gather on the Arctic shore to escape hordes of mosquitoes.

As we noted earlier, we are not the first to review crude oil shipments in the Arctic. The most direct of the earlier reports, produced by the Beaufort Sea Panel, suggested a pipeline route because it was particularly worried about oil spill clean-up in Arctic waters. If tankers were to be used, however, they should be Arctic Class 10, and only be deployed following more research and development and an experimental phase.

Many things have changed since the Beaufort Sea Panel released its report in 1984. The Inuvialuit Final Agreement, the land claims settlement for the western Arctic, has now been implemented, with its important provisions on environmental screening and review, as well as on compensation. Offshore hydrocarbon exploration and development activity has tailed off dramatically. There are plans for massive gas exports from the Mackenzie Delta-Beaufort Sea region, but a pipeline rather than a tanker route is the preferred option of most proponents. Development of the gas reserves of the High Arctic cannot be ruled out, but is not likely to occur in this decade.

The capacity to handle small spills in the Beaufort Sea is more than adequate, thanks to the Canadian Coast Guard and industry cooperatives at Tuktoyaktuk. Elsewhere, small spill response capability is inadequate. Ability to handle larger spills offshore, while tankers are in transit, is non-existent throughout the Arctic. Furthermore, research and development expenditure on oil spill countermeasures has been reduced dramatically since the Beaufort Sea Panel released its report six years ago, despite recommendations by the Panel that funding be increased.

A number of groups participating in the Arctic hearings, including the territorial governments, urged us to take a strong stand against commercial crude oil shipments by tanker. We share their concerns. Like them, we wish to discourage such shipments as much as possible and we feel this can best be done by encouraging the use of pipelines for crude oil transport. Under recent land claims settlements in the North, natives themselves will be able to screen and review tanker proposals, impose stringent conditions on their use, or even prohibit them.

Recommendation 6-32

We recommend that overland pipelines be the preferred transportation option for Arctic crude oil from the Beaufort Sea-Mackenzie Delta region and that the Government of Canada establish policy to this effect.

The Inuvialuit presented us with an interesting proposal to discourage tankers and encourage pipelines. In their proposal for an oil spill compensation fund, they suggest that the levy on all crude oil shipments be fixed at 20 cents per barrel for marine tanker shipments, versus 2 cents per barrel for pipeline shipments. The differential would reflect the higher environmental risk of tankers over pipelines. We support this concept and feel that a provision could be included in the terms of the Ship-source Oil Pollution Fund to accommodate a special Arctic oil levy.

Currently, Bent Horn is the only project involving regular crude oil shipments. There may be pressure for more

seasonal shipments of crude oil from various parts of the Arctic in the future. We are concerned about the incremental effects of these ventures. A project that is small-scale and relatively innocuous in, and of, itself can expand to unacceptable proportions; it can also set a precedent for a host of other projects which together become unacceptable. Bent Horn causes concern on both of these fronts.

Panarctic maintains oil spill clean-up equipment on the beach at Bent Horn, as well as at Rea Point on Melville Island, the firm's northern supply base. Moreover, the crew of the *M.V. Arctic* is trained in clean-up procedures and the vessel has five VHF radios, absorbent material, 600 metres of boom, marker buoys and empty drums. Even among company officials, however, there is some concern about the ability of the vessel's outer hull to withstand multi-year ice while cruising at a speed greater than 10 knots. Another concern stems from the transfer of oil to the smaller tankers, an invariably risky operation, and one which led to a spill in 1989. Panarctic itself admits that it would have extreme difficulty cleaning up a large spill from the *M.V. Arctic*.

Following the *Nestucca* and *Exxon Valdez* spills, the Canadian Coast Guard required Canarctic to upgrade its Bent Horn contingency plan. It also turned down a request from Panarctic to make a third entry into Zone 1 to pick up crude at Bent Horn. Thus, for the time being at least, it is expected that two shipments per year will continue, until either Bent Horn is depleted or another field is developed. The Bent Horn project was originally a small-scale demonstration project to show how crude oil could be safely shipped out of the Arctic by tanker. After five years of operation without any major incidents, the project could be termed a success, but it is no longer experimental. Panarctic is reportedly also interested in developing its offshore Cisco field, using underwater pipelines and submarine supertankers to get the oil to market.

This leads us to our second major recommendation for the Arctic region.

Recommendation 6-33

Commercial shipments of crude from Bent Horn not be allowed to expand beyond the current two shipments per year without a full environmental assessment. The current shipments be conducted under Coast Guard supervision using a double-hulled vessel with icebreaker escort.

II. Tankers and barge resupply operations

Many of the participants at the hearings emphasized that since Arctic petroleum transport is by nature a risky operation, it should be considered only when there is no other viable alternative. We concur with this.

Unfortunately, Arctic coastal communities do not have much choice: fuel is either delivered by sea or not at all. Increasing storage tank capacity onshore might reduce the need to go into a site when conditions are adverse, but we do not want to see greater storage capacity lead to the use of larger tankers. Given the harsh environment, we also find it difficult to urge northerners to keep volumes down by conserving energy. We would hope, however, that alternative energy sources for the Arctic would be developed.

Recommendation 6-34

In order to minimize risks from tanker shipments in Arctic waters, community fuel resupply operations be kept to an absolute minimum and cost-effective ways of doing this, including alternative energy sources, be explored.

III. Mandatory double hulls for tanker resupply

None of the existing tankers used in Arctic fuel resupply are doubled-hulled. While we believe that they should be, we are reluctant to require costly refitting on all of them, since most are nearing the end of their service and none operate in the North for more than a few months per year, during the open-water season.

Ironically, many of the sealift tankers operate south of the 60th parallel throughout the winter months, in conditions almost as risky as those encountered during the Arctic shipping season. Thus, the requirement that tankers used in the Arctic be double-hulled would benefit southern shipping as well.

Recommendation 6-35

In order to minimize risks from tanker shipments in Arctic waters:

- *it be mandatory for tankers involved in Arctic fuel resupply to be double-hulled;*
- *existing tankers be grandfathered, but replaced with an ice-reinforced, double-hulled fleet over the next seven years.*

IV. Barges on the Mackenzie

At the public hearing in Norman Wells, NTCL told us that it did not believe that double hulls are required on petroleum barges on the Mackenzie River. They are impractical on the Mackenzie, since in places there is only a three- or four-foot draught. NTCL proposed instead that the emphasis be placed on providing better infrastructure for barge transport, notably piers. The company pointed to the fact that all its barges are highly compartmentalized and that the Mackenzie has a predominantly sandy bottom, which reduces the severity of any groundings. NTCL did, however, express concern over the safety of operating barges in rocky areas, particularly in the major rapids on the river at Sans Sault and the Ramparts.

Double hulls on barges would perhaps increase the likelihood of groundings on the Mackenzie. It would appear, therefore, that a more effective and more efficient way to ensure safe petroleum barge transport would be to require government inspection, something which does not exist at present. We recommend this in another section of this report.

V. Charting

As we noted in our interim report, there is a clear need to update navigational charts in the Arctic. With the exception of the entrances to community harbours, the Northwest Passage and parts of the Beaufort Sea, most Arctic waters have not been charted to modern standards. Canada still relies on British Admiralty charts for many areas.

Some of the routes used by tankers and barges each year are considered to be quite dangerous (around Dolphin and Union Strait, for example). The Government of the Northwest Territories, Canarctic Shipping and the Canadian Arctic Resources Committee all decried the present state of affairs. At the current pace, Arctic charting will be accomplished at the rate of only one per cent each year.

Our recommendation on charting appears in Chapter 3 of this report.

VI. Sensitivity mapping and Environmental Pilot

An excellent sensitivity map now exists for the Beaufort Sea region and a similar one for Lancaster Sound is nearing completion. Various people suggested that one be developed for the Mackenzie River as well. We strongly agree.

We also feel that a Northern Environmental Pilot be published and be required on all vessels entering Arctic waters. The Environmental Pilot would include maps showing critical times and areas for marine mammals and harvesting by native groups. The Lancaster Sound Land Use Planning Commission recommended such a pilot for the area under their purview and we feel that it should be applied more broadly, wherever there is tanker or barge traffic.

The Canadian Rangers should also be consulted by shippers, when appropriate, for their knowledge of local conditions. In order to make of use of native knowledge of ice conditions and wildlife habitat, vessels transitting Arctic waters should consider having an Inuk on board.

Recommendation 6-36

A sensitivity map or atlas for spill response be developed for the Mackenzie River, for use in the event of an oil spill.

VII. Control of maritime traffic

Present shipping regulations do not allow for exclusion of vessels from certain waters for environmental reasons. Some of the participants at the hearings, including the Government of the Northwest Territories, have asked that this situation be rectified. We agree that it should be, and we note the recommendation of both the Beaufort Sea Panel and the Lancaster Sound Land Use Planning Commission in this regard.

The Commission recognized first of all that, in accordance with international law, foreign-flag vessels enjoy the right of innocent passage in Canada's territorial sea and the right of freedom of navigation seaward of this 12-mile limit. It nevertheless recommended that "whenever safe and practical to do so, all ships should remain at least 12 to 15 miles from the coasts of Lancaster Sound, unless approaching or leaving a port", so as to avoid direct contact with concentrations of marine wildlife. Elsewhere in the region, ships are to remain at least six miles from the coast.

As for the Beaufort Sea region, the Inuvialuit of several communities have recommended to their planning commission that ship traffic be halted or rerouted during sensitive times, such as the polar bear denning season between November and May. We are not in a position to stipulate with any precision which areas should be avoided, but we do endorse the principle.

Recommendation 6-37

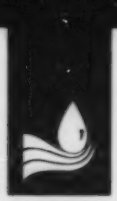
The Canada Shipping Act *be amended to allow for routing of tanker and tank barge traffic around sensitive areas at crucial times.*

VIII. Fuel delivery

There are several ways in which the present practice of transferring fuel from tankers and barges to shore could be improved. One of the riskier aspects of fuel delivery involves the use of a hose

"The people that are now responsible for spills are not capable of looking after wildlife."

Simon Nattaq



"Almost three quarters of the people in the settlements who are old enough to get around, I mean children over the age of four and up, almost three quarters of those people will indulge in fishing activity during the course of a year. The food value and the cultural value should not be underestimated."

Ron Allen,
Department of Fisheries and Oceans

from ship to shore. In rough weather the hose can easily rupture, and sometimes oil is spilled. The chance of this occurring would be reduced if, as several people suggested, a wire were attached to the hose to bear the strain.

It has also been suggested that the problem of floating hoses could be eliminated if there were adequate docking facilities in the Arctic. While we have not explored the matter in any detail, we are not optimistic that the tremendous expenditures involved in building and maintaining piers for each Arctic site would be cost-effective. Nevertheless, there is no doubt that piers should be built at some harbours because of navigational risks, the volumes shipped or other factors. NTCL, for instance, mentioned three that it has asked the federal government to build, in the western Arctic alone.

Other ways to reduce the risk of spills from hoses include using trained local inhabitants at the transfer point, conducting on-site random inspections of the offloading equipment, checking for drug and alcohol abuse, and having a workboat in the water to push back ice and directly monitor the transfer operation.

Recommendation 6-38

In order to enhance the safety of Arctic resupply operations:

- *it be standard practice to have taut cables attached to floating hoses, to bear the strain of wind and tides;*
- *piers also be constructed at hazardous or high-volume locations.*

IX. Floating environmental platform

We would like to note the cancellation of the forward-looking *Polar 8* icebreaker. Although it would have been extremely expensive, and the problem of refuelling it had not yet been resolved, the *Polar 8* would have gone a long way towards asserting Canadian sovereignty in the Arctic, should foreign tankers ever attempt to transit the Northwest Passage. The vessel would have also provided the first significant national capability to enforce Canada's Arctic pollution regulations year-round.

Even more significant, the *Polar 8* was to have a very specific and important role to play in oil spill monitoring and clean-up. According to the initial environmental evaluation released February 1, 1990, the *Polar 8* would have been capable of providing fuel and other supplies to Arctic sites during emergencies. Its crew complement would have included a dangerous and toxic materials team, and there would have been space on board for up to 150 spill clean-up personnel.

In addition to the $4.5 million in pollution clean-up equipment which would have been procured, two large helicopters, with specially developed sensors for oil spill detection, would have been used for environmental monitoring, and pollution surveillance and control. They would have also been used to transport personnel and equipment (such as small boats and skimmers) to the spill site. On site, they would have been used for the operation and deployment of drip torch ignition systems, foam and water fire-suppression systems, and containment booms.

Cancellation of the *Polar 8* does not obviate the need for a special purpose vessel to be present in the Arctic in the event of a major oil spill. Existing Canadian Coast Guard icebreakers do provide adequate escort service to fuel resupply vessels, but the need for another vessel to be made available for personnel and equipment delivery, to act as command headquarters and to receive transferred oil and debris, should be explored as part of the annual sealift. The oil spill response barge in Tuktoyaktuk has a helicopter pad and accommodation facilities, making it a good candidate for use in the Arctic.

Recommendation 6-39

In order to facilitate response, the federal government provide a dedicated oil spill monitoring and clean-up vessel for operation during each Arctic shipping season.

X. Clean-up equipment aboard Coast Guard icebreakers

We were rather surprised to learn that only three ships of the Coast Guard Arctic icebreaker fleet have oil spill clean-up equipment packages on board and that, before 1989, *none* of them had equipment for this purpose.

Recommendation 6-40

In order to accelerate spill response, all Canadian Coast Guard icebreakers operating in the Arctic should have containerized spill clean-up equipment on board, as well as a crew trained in its use.

XI. Equipment aboard tankers and barges

Delivery vessels should carry oil spill clean-up equipment.

Recommendation 6-41

In order to speed up spill response, all tankers and barges in the Arctic should have oil spill containment and recovery packages on board, as well as crews trained in their use.

XII. Equipment depots in the eastern Arctic

According to the Government of the Northwest Territories, only three coastal communities (Rankin Inlet, Coppermine and Iqaluit) have clean-up equipment stored locally and it is used mainly for training purposes.

In order to ensure full preparedness, a spill response capacity must be available at every site where oil and fuel are offloaded.

Recommendation 6-42

In order to enhance local response capability, the Canadian Coast Guard ensure that Arctic communities where oil is handled be supplied with oil spill containment and clean-up packages, and that sealift communities be equipped to handle a spill consistent with the worst-case scenario.

In order to improve response times, Arctic response equipment, including life support equipment, be relocated to the Arctic and regional depots be established for rapid deployment to spill locations.

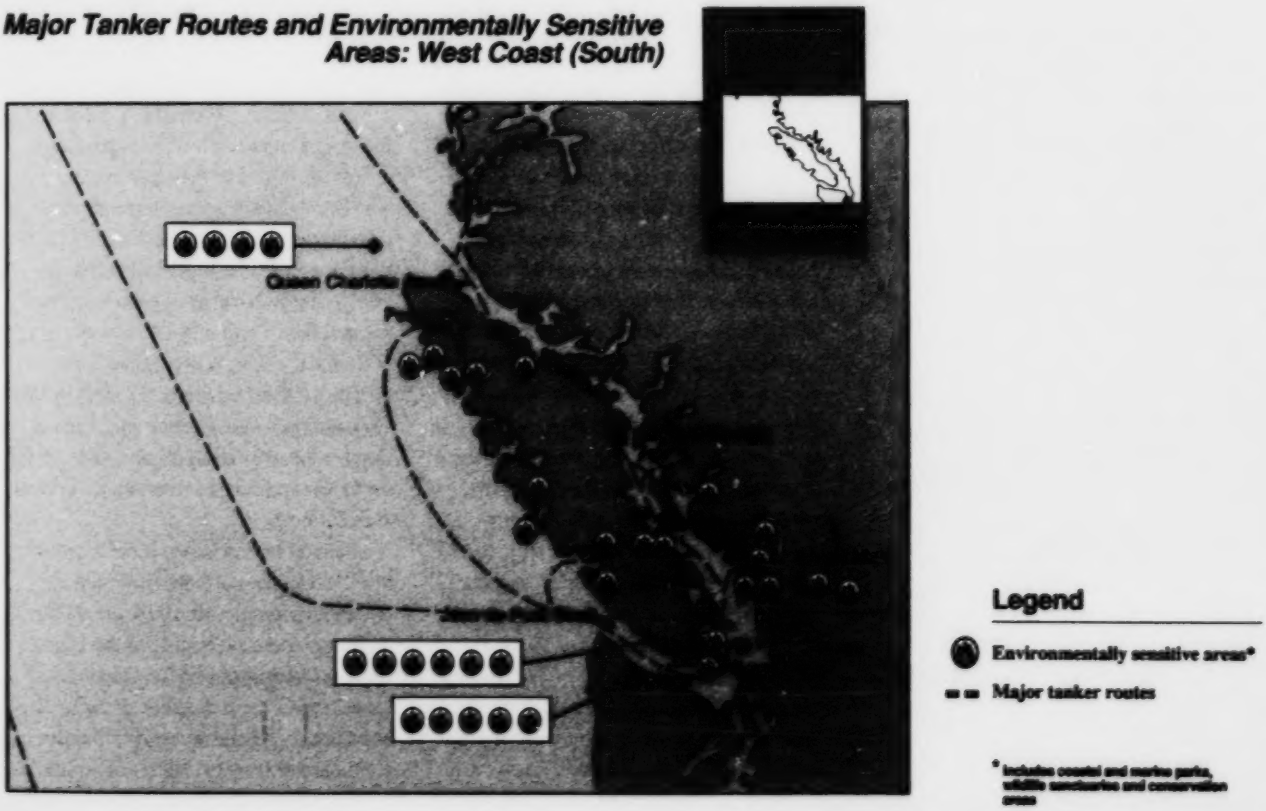
The West Coast

Special features of the region

The coast of British Columbia is 25 700 kilometres long. Featuring long, deep fjords, inland passages, estuaries and remote islands, much of it is rugged and only accessible by water. The outer coast is characterized by inclement weather, including harsh storms, sea-spray icing and fog. Sea states are a significant problem for mariners; storm-and tide-driven currents are strong and wave climates are comparable to the most severe anywhere in the world. In Hecate Strait, for example, waves reaching over 30 metres have been recorded during severe storms. In short, as someone from Environment Canada's Atmospheric Environment Service stated at the hearings in Vancouver:

"The northern Pacific Ocean has often been pegged as a 'graveyard for ships'. Severe winter storms are routine, often accompanied by storm-force, at times hurricane-force, winds and near zero visibility. For vessels near the rugged coastline these conditions can lead to especially hazardous situations. The adverse weather may last several days and can develop with surprising speed, catching mariners offguard."

Major Tanker Routes and Environmentally Sensitive Areas: West Coast (South)


Queen Charlotte
Legend
Environmentally sensitive areas*
Major tanker routes
* Includes coastal and marine parks, wildlife sanctuaries and conservation areas

"No one realized the potential of the communities to assist with all aspects of the operation."

Glen Stewart, Canadian Coast Guard

On the upland are the steep, forested coastal mountains from which is difficult to access the water. Offshore are some of the world's most spectacular islands, including the picturesque Vancouver Island and Queen Charlotte Islands.

Protected by Vancouver Island and other smaller islands is a vast network of inlets, passages and inland seas. The largest is the Strait of Georgia, on which the City of Vancouver is located. Inland waters have milder wave climates than the outer coast, but are affected by significant river and tidal currents which twist and wind through the many islands and passages. Currents can reach 10 knots in places, meaning that oil slicks would spread rapidly.

The entire West Coast is an extremely productive ecosystem, ranging from open ocean, rocky shores and sandy beaches to protected water with brackish, intertidal wetland areas. It possesses numerous varieties — and immense populations — of fish, marine mammals, plants and birds. Five species of salmon spawn in a multitude of rivers and streams, feed and rear in estuaries and near-shore waters and migrate thousands of miles across the Pacific. Herring, which spawn in coastal waters, groundfish and shellfish are all plentiful. The coast is home to many pods of killer whales, dolphins, porpoises and other marine mammals, including the grey whale, which migrates along the British Columbia coast from the Arctic to Baja, California, and two colonies of sea otters, now an endangered species. Tremendously productive plankton communities, upon which so much marine life depends, are also found throughout the coast.

The British Columbia coast provides feeding, staging and resting areas for millions of birds on the Pacific Flyway, a migratory route from Siberia to South America. Many species of waterfowl, including sea gulls, loons and grebes, as well as shorebirds and birds of prey depend on coastal habitats. Also found along the coast are raptors such as eagles, which commonly prey on fish, and several species of diving birds, including alcids and diving ducks — all of them extremely vulnerable to oil pollution. The region is home to significant world populations of rhinoceros auklets (27 per cent), Cassin's auklets (71 per cent), and ancient murrelets (42 per cent), as well as to 78 per cent of the Canadian population of tufted puffins.

Pacific Rim National Park, whose beaches were oiled by the *Nestucca* spill, is a very sensitive area, as is the Fraser River estuary, an ecosystem of international significance. The region's shorelines and near-shore waters are biologically important because of the juvenile salmon, herring roe, shellfish, birds and marine mammals which use these areas at various stages of their life cycles. The Fraser River is the most important salmon-producing river in North America, and its estuary is considered vital to the well-being of young migrant salmon. Just south of the Fraser estuary is Boundary Bay, which exceeds the criteria established under the RAMSAR Convention — an international convention for the protection of rare bird species — for designating internationally critical sites for birds.

Several Indian bands have inhabited the West Coast for thousands of years, creating numerous archaeological sites, including those belonging to the Haida. In just one area around the Queen Charlotte Islands, there are 15 especially sensitive locations and some 2000 known Haida archaeological sites. One of these

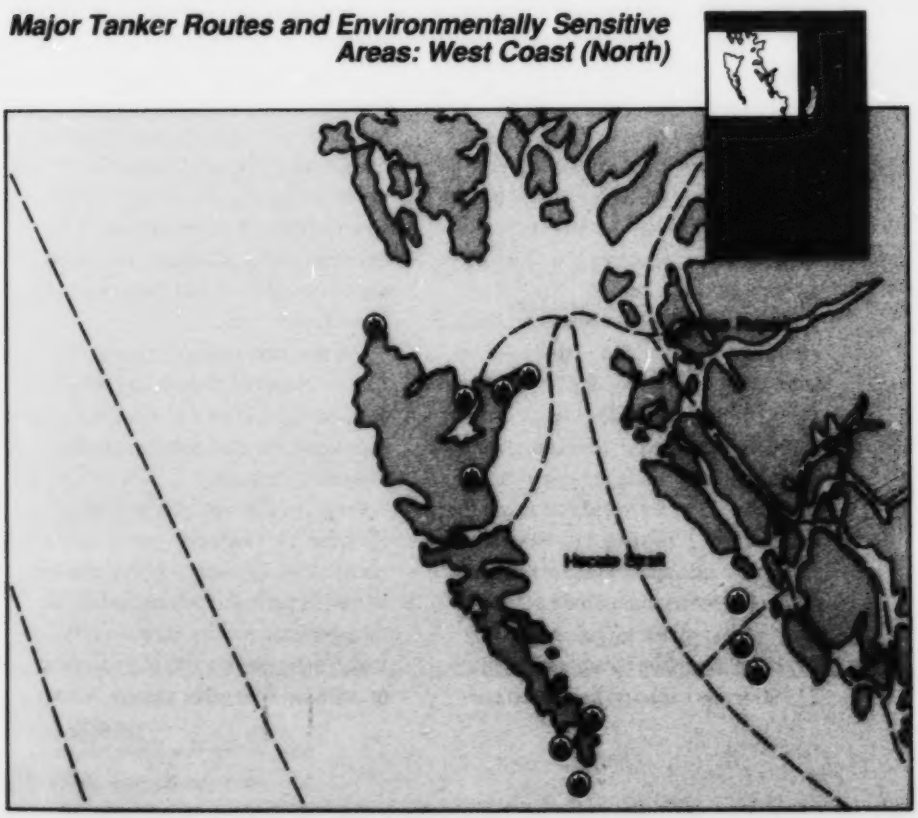
sites, at Ninstints on Anthony Island, has been designated a World Heritage Site by the United Nations.

British Columbia's economy and its coastal settlements are similarly dependent on the natural resources of the coast. The fishery employs 24 000 people directly, with an equal number in the processing sector. Salmon, herring, various groundfish, prawns, crabs, shrimp, clams, oysters, mussels, abalone, and geoducks are all harvested. In 1988, the wholesale value of the landed catch was above $500 million. There is also a thriving aquaculture industry in the province, which now includes 125 salmon farms.

Native communities told us of their dependence on marine resources for income and food. As Chief Larry Baird of Ucluelet stated, "The beach is our table; once the tide is out, our table is set." Native, commercial and sport fishermen all depend on healthy, self-sustaining stocks of fish and shellfish. This is only possible if habitats are protected from damage and fish are not fouled or tainted — or even thought to be.

Because of British Columbia's temperate climate, spectacular scenery and abundant wildlife, recreation and tourism are concentrated along the coast and on the waters. For example, the Department of Fisheries and Oceans estimates that in 1985 $402 million was spent in the sport and recreation sector, mainly in coastal parks, campsites, marinas and fishing resorts. British Columbians own more recreational boats per capita than any

Major Tanker Routes and Environmentally Sensitive Areas: West Coast (North)


Hecate Strait
Legend
Environmentally sensitive areas*
Major tanker routes
* Includes coastal and marine parks, wildlife sanctuaries and conservation areas

other place in Canada (1 household in every 5). The province's coastline is also highly valued by the cruise ship industry, which offers very scenic and popular trips from Vancouver to Alaska, through the Inside Passage. In recent years, sailing, sailboarding, wilderness kayaking, and whale watching tours have also grown dramatically in popularity. All these activities require unspoiled environments and clean water. Threats to these environmental attributes from oil spills would greatly reduce their ability to sustain recreational or economically viable activities.

Vessel traffic

Although many coastal communities in British Columbia depend upon tankers and barges for fuel delivery, all the crude oil and most of the petroleum products and chemicals shipped to and from British Columbia ports move through the Greater Vancouver area. In 1986, 98 per cent of the dangerous goods transported by water within this area passed through Burrard Inlet. Of the 3.5 million tonnes shipped, 40 per cent was gasoline and 13 per cent was crude oil.

Vancouver Port Corporation officials told us that four million tonnes of petroleum products were shipped through the Port in 1988. Half of this was shipped by barge and tanker to coastal communities in the province, while the rest went to destinations in the United States and the Pacific Rim. That year, the National Energy Board approved the expansion of the Trans Mountain Pipe Line Company's Westridge terminal in Burnaby, where three storage tanks, each with a 23 790-tonne capacity, have been constructed. Once maximum export capacity is reached in 1992, approximately two million tonnes per year will be exported, which means that up to 24 barges and 24 tankers will visit the terminal each year. If approved, a second pipeline from Edmonton to Burnaby would increase shipments to nine million tonnes per year — enough to fill 90 tankers. Vancouver is rapidly becoming a significant oil port.

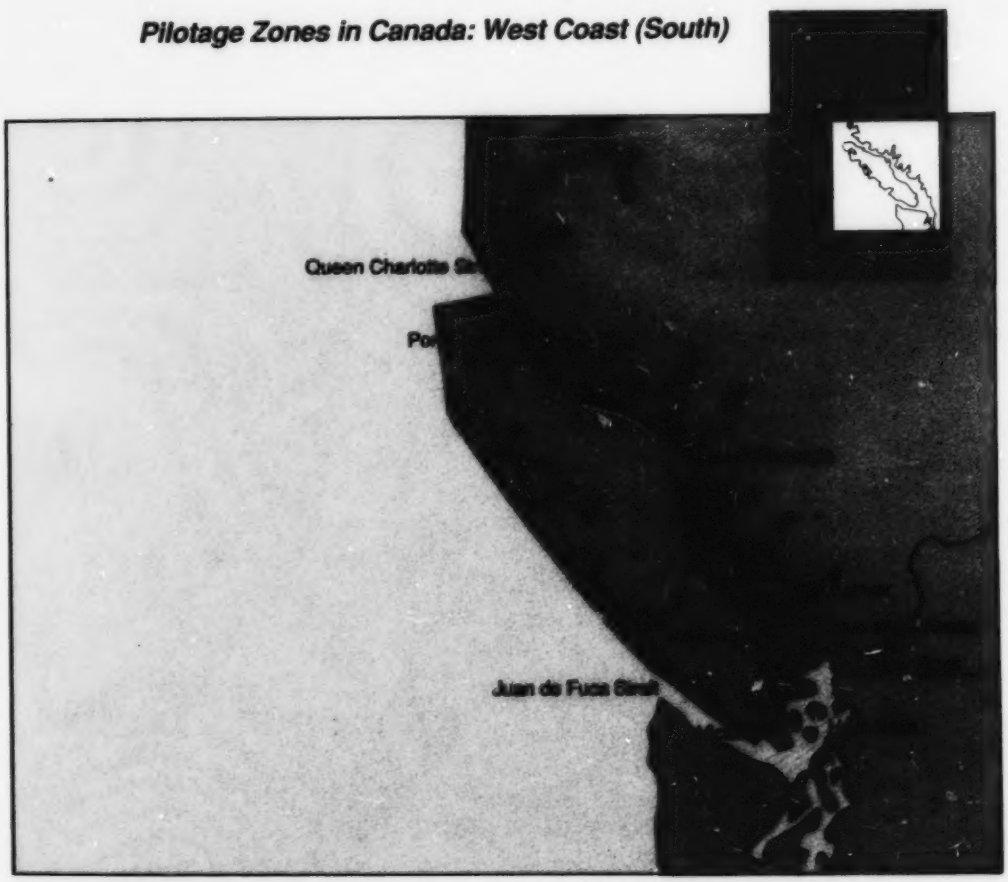
Tanker traffic from Valdez, Alaska poses the greatest current threat of spills to the B.C. coast. Since crude oil shipments from Valdez to Port Angeles and Cherry Point in Washington State began 15 years ago, there have been over 9000 supertanker voyages off Vancouver Island. A loaded tanker leaves Valdez about every two and a half days. Between January 1 and April 30, 1989, ninety laden tankers travelled down the West Coast. Voyages to Cherry Point, immediately south of Boundary Bay and Vancouver, are particularly perilous due to the narrow passages and navigational hazards along the way. Analyses of spill scenarios suggest that a major spill at Cherry Point would rapidly reach the San Juan and Gulf Islands, as well as the mainland coast and have extensive impact on the area.

Among the areas of greatest risk for the movement of tankers and barges are Juan de Fuca Strait, the Strait of Georgia, Johnstone, Rosario and Haro straits, Boundary Pass, and the First and Second Narrows of Burrard Inlet in Vancouver Harbour. This high risk stems from a combination of factors: heavy volumes of traffic; narrow channels and strong tidal currents; and inclement weather, which increases the risk of grounding or collision with other vessels. Vessel

Traffic Services (VTS), navigational aids, the use of pilots and escort tugs, the requirement to "Clear First and Second Narrows" of other traffic as well as the booming of tankers at refinery terminals obviate some of the risk, but by no means all of it. During the hearings, we learned that the Canadian Coast Guard had planned to install vessel traffic radars to cover the entire coastline, but that these plans were scrapped 12 years ago because of budgetary restraint.

Imperial Oil Limited and Trans Mountain Pipe Line Company have recently taken measures to reduce the risks created by the movement of crude oil by supertanker through the Port of Vancouver. These include making available: four tugs to escort oil tankers through the Second Narrows; two tugs to escort vessels from Second Narrows through First Narrows; and one to escort them as they move through Boundary Pass and Haro Strait to Victoria.

Pilotage Zones in Canada: West Coast (South)



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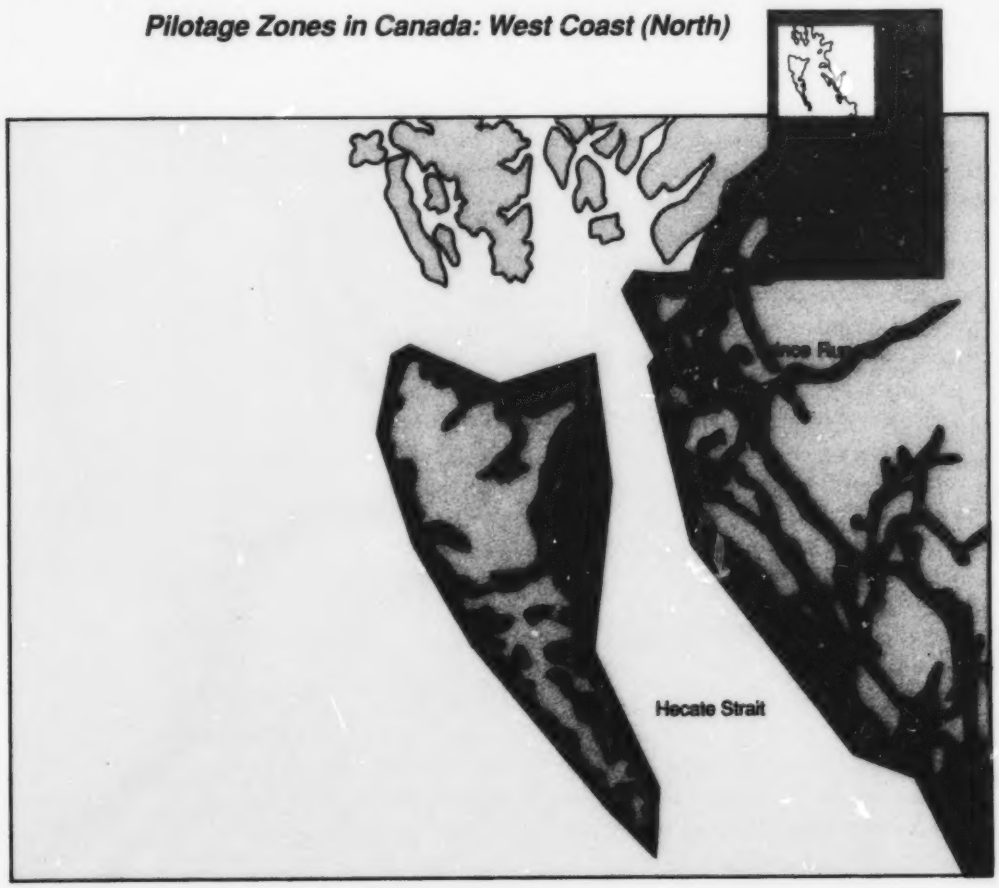
Compulsory pilotage zones

Tankers are not the only source of risk of major spills in the West Coast; a large volume of oil and chemicals is shipped by tank barge along inland passages. As indicated above, in 1988 two million tonnes of petroleum products were shipped by barge to Prince Rupert, Port Hardy, Nanaimo and other communities. Chemical barges also serve ports such as Kitimat, nearly 100 kilometres inland, at the head of a deep fjord. Chlorine is delivered by barge to many of the pulp mills on Vancouver Island and at Powell River. There is also significant U.S. tug and barge traffic moving between Washington and Alaska.

In addition to tank barges, a considerable volume of chemicals is shipped between the mainland and Vancouver Island by rail ferries. Several years ago, three rail cars of chlorine fell unnoticed from a barge somewhere near Sechelt; despite an extensive search, they have never been found.

Pilotage Zones in Canada: West Coast (North)



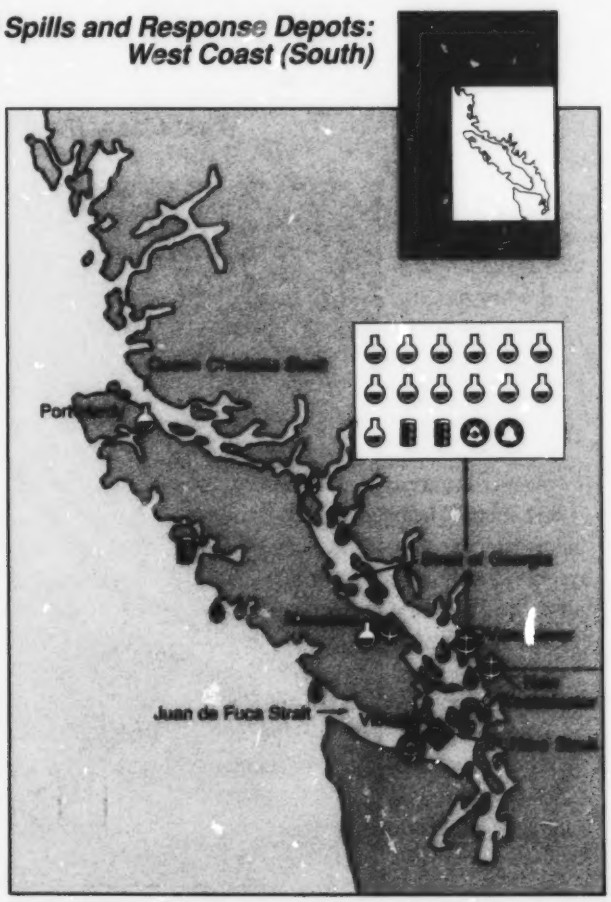
Recent spills

In 1972, the freighter *Vanlene* ran aground at the entrance to Barkley Sound spilling 400 tonnes of Bunker B fuel, diesel and lubricating oil. Due to favourable weather and sea conditions, only 19 kilometres of shoreline were oiled. In 1973, the freighters *Erawon* and *Sun Diamond* collided at the entrance to Vancouver Harbour, oiling the beaches of West Vancouver. That same year, the freighter *Irish Stardust* struck a reef near Alert Bay and spilled 480 tonnes of Bunker B fuel oil, resulting in a 160 kilometre slick in Johnstone Strait and Queen Charlotte Strait.

In 1979, the ore carrier *Lee Wang Zin* overturned in Dixon Entrance, spilling an estimated 1200 tonnes of Bunker C and diesel. Up to 560 kilometres of adjacent Alaska shoreline were contaminated.

The National Analysis of Trends in Emergencies System (NATES) data base recorded 78 significant spills in B.C. waters between 1980 and 1987. Particularly noteworthy was the 1985 spill from the tanker *Arco Anchorage*, which ran aground, releasing 470 tonnes of crude oil at Port Angeles, Washington in Juan de Fuca Strait.

Oil and Chemical Spills and Response Depots: West Coast (South)



Legend

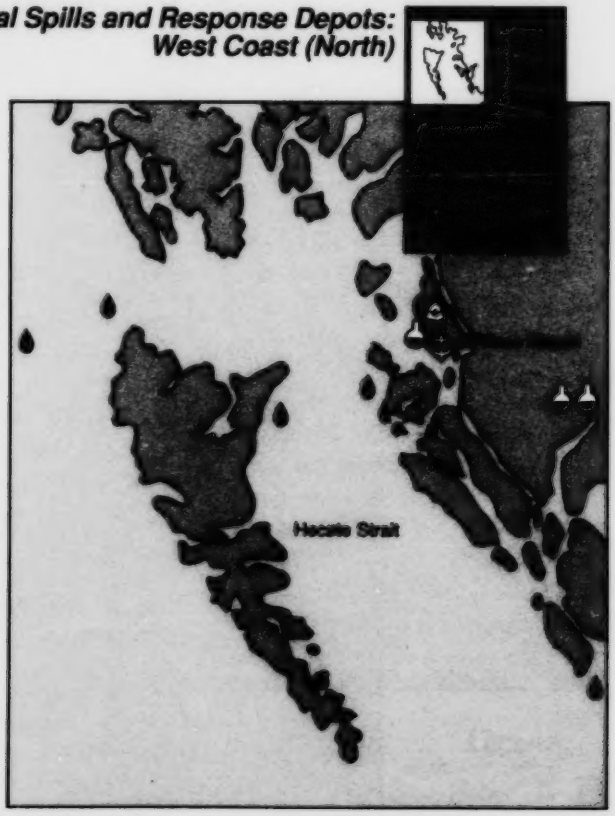
- Major port
- Past oil and chemical spills
- Chemical facility
- Oil refinery
- Industry spill response depot
- Government spill response depot

The two largest recent spills in the region were the December 1988 *Nestucca* barge spill, in the adjacent state of Washington, and the March 1989 *ExxonValdez* disaster in Prince William Sound. Neither of these were caused by Canadian vessels or vessels bound to, or from, Canadian ports. The *Nestucca* oiled 150 kilometres of Vancouver Island's shoreline as well as extensive areas of the coast of Washington . An intensive clean-up effort and a lengthy Coast Guard review followed. As a result of the *Nestucca* and the *Exxon Valdez* spills, we were given the mandate to perform an independent review. The *Nestucca* spill response, the issues it raised, and particularly the lessons learned, are discussed at some length in chapter 4.

Finally, due to foggy conditions, the grain carrier *Rubin Lotus* struck the *Arcturus*, a Polish fishing vessel, in February of this year, while the latter was taking on fuel in Vancouver Harbour. It will cost at least $1 million to clean up the 40 tonnes of diesel that were spilled into the harbour.

To date, the overall safety record of the petroleum industry's tankers and barges has been good. There are concerns that there will be a greater risk of spills when tanker shipments of crude oil from the Trans Mountain Pipe Line Company's Westridge terminal in Burnaby increase, as discussed above.

Oil and Chemical Spills and Response Depots: West Coast (North)



Legend

- Major port
- Past oil and chemical spills
- Chemical facility
- Government spill response depot

Previous reviews

The public is very concerned about oil spills and government cannot say that there were no warnings about the potential seriousness of oil spills. Before the Trans Alaska pipeline was constructed in the mid-seventies, B.C. residents were vociferously opposed to the tanker traffic that would result along the B.C. Coast. David Anderson was one of the leading critics of the tanker route proposed. Their efforts, together with those of Washington and Alaska citizens, led to improved safety requirements for the Valdez tanker route, including stand-by escort tugs. Unfortunately, early promises by the U.S. Coast Guard that tankers would be double-bottomed were later dropped — a decision which, along with many other safety lapses, had catastrophic consequences for Prince William Sound.

In 1976, a consortium of U.S. oil refining companies proposed a deep-sea oil port and terminal at Kitimat, at the head of a deep fjord on the northern B.C. coast. The following year, the federal government appointed Dr. Andrew Thompson as Commissioner of Inquiry to hold public hearings and make recommendations concerning the environmental and socio-economic impact of the proposed refinery, terminal and associated pipelines. The mandate included a review of oil spill risks and of navigational risks that would be faced by West Coast oil tanker traffic. The inquiry was adjourned when the pipeline proposals were withdrawn. However, Dr. Thompson issued a *Statement of Proceeding* which recommended that the Canadian government rule against a West Coast oil port, since there was clear evidence that there was no foreseeable need for Canada to have such a facility. If such a need developed, he recommended that the inquiry be extended to address several remaining problems, including navigational safety, the risk of oil spills and regional socio-economic impacts.

In 1986, the federal-provincial West Coast Offshore Exploration Environmental Assessment Panel completed its report on oil exploration on the northern B.C. coast. B.C. residents, especially native people appearing before the Panel, expressed great concern about the risks of an oil spill from an oil well blowout. The Panel concluded that sensitivity mapping was seriously inadequate and should be updated, that contingency plans must be regularly updated, that volunteers must be trained in advance of a spill, that the Coast Guard should upgrade its countermeasures resources, and that shoreline clean-up strategies should be detailed. While the Panel report concerned offshore oil well drilling which was never approved, the excellent recommendations it contained, had they been implemented, would have gone a long way towards preparing the Coast Guard for the *Nestucca* spill in December 1988.

In 1988, a federal Environmental Assessment and Review Panel was appointed to review the effects of a proposed jet fuel barge terminal to serve Vancouver International Airport. The Panel concluded that the terminal would "pose unacceptably high risks of damage in the Fraser River estuary. The potential consequences of a fuel spill are made more severe by the fact that an adequate spill response capability does not now exist in the lower Fraser River and is unlikely to be developed in the foreseeable future." The Panel recommended unconditional rejection of the proposal.

An environmental emergencies working group under the Fraser River Estuary Management Program is presently examining various contingency plans and emergency response capabilities for responding to spills on the environmentally sensitive lower Fraser River. It has looked at the feasibility of establishing a spill response depot on the estuary. We believe that such a depot would be valuable in addressing present spill risks, but we are firmly convinced that the estuary is just too sensitive and important to allow any additional significant bulk oil or chemical shipping in the area.

In March 1989, an intergovernmental task force was formed on the West Coast to address the risk of oil spills. British Columbia, Washington, Alaska, Oregon and California are represented on the task force, which is known as the States/British Columbia Task Force on Oil Spills. As explained in the interim report issued by the Task Force in December 1989, four subcommittees have been established:

- the Prevention Alternatives Subcommittee is evaluating ways to improve spill prevention through changes in operating procedures, regulations and laws;
- the Emergency Response Subcommittee is identifying ways to strengthen countermeasures;
- the Financial Recovery Subcommittee is exploring ways to recover costs and damages from those responsible for spills;
- the Technology Sharing Committee is looking at state-of-the-art clean-up equipment.

The Prevention Alternatives Subcommittee is also overseeing three studies by outside consultants: the Tanker/Barge Safety Study, the Navigation Risk Study and the Environmental Risk Evaluation. A fourth study, on Routing and Emergency Response, is being conducted with internal resources by the government of British Columbia and the federal government.

Among the issues the Task Force is expected to deal with in its final report are the building of an overland pipeline from the Trans Mountain Pipe Line Company's terminal in Burnaby to Puget Sound (thereby obviating the need for some of the barges in Burrard Inlet), and the extension of the West Coast Tanker Exclusion Zone further offshore.

In May 1989 the premier of British Columbia appointed former M.P. David Anderson as a special advisor to review the risk of oil spills on the West Coast. Mr. Anderson held extensive public meetings in 18 B.C. communities and completed his report in December 1989. He made 184 recommendations relating to improved tanker safety and marine spill preparedness. Among other things, he recommended an end to exports of oil through the Port of Vancouver; higher petroleum taxes to reduce consumption; the recycling of motor oil; improvements to navigation support systems; and the establishment of a special oil spill response agency to include government, interest groups, and industry. The agency would be funded through a levy on oil products shipped through B.C. waters.

Mr. Anderson concluded that the quality of the vessels and the competence of the crews involved in shipping oil in B.C. was "below what it should be to protect our waters". To rectify this, he

recommended that strong actions be taken against shipping companies who do not maintain high standards for vessel condition and crew competence.

The hearings

Eight days of hearings were held in Tofino, Vancouver, Victoria and Prince Rupert in July, November and December 1989.

During our initial consultations in Vancouver and Tofino, several people gave vent to the very real anger, frustration and sense of outrage they felt over the handling of the *Nestucca* incident and what they viewed as the cavalier attitude of both the federal and provincial governments towards the risks that tanker traffic poses to British Columbia's marine environment. The legitimacy of our mandate was also questioned.

In many ways, these interventions were especially useful: they helped underline in stark, unambiguous terms the urgency with which many viewed the issue of tanker traffic and strengthened our resolve to produce a comprehensive, effective report that addressed the myriad concerns which had been articulated.

An extremely diverse group participated in the West Coast hearings. Several firms availed themselves of the opportunity to describe to a wider audience innovative and potentially quite effective spill response equipment they had developed. Other firms or business associations took time to clarify, rebut or counter suggestions made by interveners that their commitment to, or procedures and practices regarding, environmental protection, were lacking.

Indeed, the give-and-take and frequent debate that characterized some of the West Coast sessions put in perspective the magnitude of the problem and the scope of the trade-offs its resolution implies.

Some of the most compelling testimony we heard came from volunteer organizations and individuals who had experienced first-hand the ravages caused by the *Nestucca* spill — people who had manned the beaches during winter storms armed with nothing more than shovels and garbage bags, argued with and cajoled intransigent officials, and picked up thousands of dead birds. Their views on such issues as liability, compensation and the need for quick turnaround for the settlement of claims carried special weight. So too did their criticisms of response capabilities and recommendations on how to improve them.

We also benefitted from several technical presentations during the West Coast hearings, especially on the issue of tanker and tank barge design and construction, the merits of single-versus double-hulled vessels, training, certification and manning requirements, pilotage and the need to improve navigational aids and Vessel Traffic Services. Several misconceptions about what resources exist to help combat spills and the effectiveness of existing technologies were dispelled during these presentations.

Numerous thoughtful and extremely helpful suggestions were made about how to minimize the risk of accidents in especially sensitive areas and where to locate response equipment depots. Native groups and fishermen underscored the merit of these suggestions by making us aware of the importance of the marine environment to their livelihood — both material and spiritual.

"... at a very minimum, large oil tankers ought to be required to have dual propulsion and steerage systems."

Philip Eby,
Fishing Vessel Owners' Association of British Colombia

Recommendations

I. Vessel traffic routing

Vessel traffic routing schemes for tankers play an important role in the prevention of accidents and marine pollution. They may be used to keep tankers away from environmentally sensitive areas such as fishing grounds or aquaculture operations. The West Coast Tanker Exclusion Zone, off Vancouver Island and the Queen Charlotte Islands, is a routing scheme jointly developed by the United States and Canada. It is intended to keep laden Alaska north slope oil tankers far enough offshore that, should they lose power, a tug can reach them before they are in imminent danger of grounding.

The *Canada Shipping Act* includes enabling legislation to make regulations pertaining to the control of tanker movements. While the International Maritime Organization (IMO) recognizes the principal of exclusion zones, it questions the need for precise compulsory regimes which may be perceived by coastal states as an attack on the rights of innocent passage. Still, through Convention, the IMO has in the past recognized "special areas" whose unique environmental sensitivity is such that more stringent rules governing vessel routing and oily-water discharges have been deemed acceptable and enforceable.

At the hearings, we heard many concerns relating to the control of marine traffic. A number of submissions addressed the adequacy of the existing tanker exclusion zone, noting that Canada's capability to monitor compliance with it is currently limited. Indeed, the only area in the entire zone within the range of shore-based radar extends from the point where Alaskan tankers alter course to where they enter Juan de Fuca Strait, and there is no regular aerial surveillance of the area by either the Coast Guard or the Department of National Defence.

Over-the-horizon radar systems, which would permit monitoring of the entire width of the zone from, for example, a location on the Queen Charlotte Islands, are only now being developed. When they become available several years from now, they will likely be very expensive.

There may be other equally effective solutions available sooner and at a more modest cost. These include a chain of inexpensive radar slave sets; aerial surveillance which could combine exclusion-zone monitoring with other pollution surveillance work; and "Automatic Dependent Surveillance", whereby a vessel is tracked by the signal of an on-board radio beacon. The latter technology is being developed by the United States Coast Guard with the active participation of the Canadian Coast Guard. In any case, it is important to develop a monitoring capability, by whatever means, so that the West Coast Tanker Exclusion Zone is more than dotted lines on a map.

In areas where the exclusion zone allows tankers to come closer to shore (e.g., off the entrance to Juan de Fuca Strait), decisions regarding shipping routes should take into account the environmental impact on the British Columbia coast of a tanker collision or break-up on the high seas. In his review for the premier of British Columbia, David Anderson points out that the outbound laden tanker traffic from the Port of Vancouver and inbound Valdez traffic means laden tankers meet each other at

"We believe that the current atmosphere of deregulation has added to the problems of oil transportation, and we see this particularly in the construction of tankers. The aim is to build the cheapest possible vessel for the largest volume and value of cargo."

Al Engler,
Canadian Brotherhood of Railway, Transport and General Workers, Local 400

the entrance to Juan de Fuca Strait. This makes extraordinary safety procedures imperative.

As for northern coastal waters, the Pacific Pilotage Authority told us that it intends to recommend to industry that a voluntary tanker routing system be adopted for tankers transitting between Triple Island and Kitimat. Under this proposed route, tankers would avoid much of the coastal traffic and bypass the narrow Grenville Channel. In addition, the Authority recently distributed guidelines for marine pilots involved in spills, in an effort to minimize environmental damage.

Yet another important point brought to our attention regarding routing schemes is that transpacific tankers bound from Vancouver should observe the exclusion zone when northbound for Japan or other Asian ports on a Great Circle route.

Recommendation 6-43

In order to promote navigational safety:

- *Decisions regarding shipping routes should take into account the environmental impact on the British Columbia coast of high seas break-ups or accidents.*
- *The waters along the west coast of Vancouver Island be submitted to the IMO for recognition as a "Special Area". In the interim, a traffic separation scheme should be developed and implemented in the area.*
- *Aerial surveillance of the West Coast Tanker Exclusion Zone be commenced immediately to ensure compliance.*
- *Oil tankers be prohibited by regulation from using Grenville Channel when transitting between Triple Island and Kitimat and additional navigational aids be provided to facilitate this route change.*
- *As a priority, the Canadian Coast Guard examine existing traffic routing schemes with a view to reducing the risk of collision due to traffic concentration at the entrance to Juan de Fuca Strait.*

II. Vessel Traffic Services

Vessel Traffic Services (VTS), including exclusion zones, traffic separation lanes and standard communication channels, provide management and communication services to vessels to assist in their safe passage through Canadian waters. Several participants at the West Coast hearings called for VTS to take on a directive role, similar to air traffic control. Others spoke of the need for strict enforcement of the traffic separation lanes in Juan de Fuca Strait and the need to ensure the separation of fishing activity from tanker traffic. Given the seasonal movements of the fishing fleets, as they follow their various catches, complete separation would be extremely difficult.

Several of the recommendations made in this section would effectively rely on VTS for enforcement. In our interim report, we noted that VTS centres across Canada often lacked the best available technology and equipment to do as effective a job as possible. We also remarked that " . . . immediate changes in procedures, upgrading of equipment and extension of VTS coverage would

contribute significantly to improved tanker and tanker barge safety in Canadian waters." We thus reiterate the recommendation made in the interim report with respect to the West Coast.

Recommendation 6-44

We recommend that the government consider immediate upgrading of equipment, extension of coverage, and changes in procedures for VTS to improve tanker safety in Canadian waters. This upgrading must include:

- *replacing existing video with extended radar coverage to eliminate the blind sector on the north side of the Port of Vancouver and to the east of Second Narrows;*
- *increasing VTS radar coverage at Tofino, the north end of Vancouver Island, the Queen Charlotte Islands and the entrance to Prince Rupert.*

III. Pilotage

Pilots familiar with local conditions and navigational hazards play an important role in ensuring marine safety. All deep-sea oil tanker traffic on the West Coast is subject to compulsory pilotage in and out of the Port of Vancouver. Most of the tug and barge traffic carrying oil is either exempt from compulsory pilotage or has the requirement waived under the Pacific Pilotage Regulations.

We feel that mandatory pilotage should exist for all tugs (with the exception of Canadian ones on coastal voyages) towing petroleum and chemical products in inside waters.

Recommendation 6-45

In order to promote navigational safety, Canadian authorities should begin consultations with their U.S. counterparts as soon as possible to establish mandatory pilotage for all tugs (with the exception of Canadian tugs on coastal voyages) towing petroleum or chemical barges in Juan de Fuca Strait, Haro Strait, Boundary Pass, the Fraser River, Burrard Inlet, the Strait of Georgia and the Inside Passage.

IV. Tug and barge inspection standards

Tugs and tank barges transport most of the 2 million tonnes of oil and petroleum products carried from the Port of Vancouver to coastal communities. While tugs are fully inspected by the Coast Guard, and are required to maintain a high standard of manning, barges are only inspected for compliance with load-line requirements. In the United States, on the other hand, tugs have a lower standard of manning, but barges are fully inspected. Canadian barges carrying crude oil or petroleum products to U.S. ports are routinely inspected by U.S. officials to ensure compliance with American regulations.

We advocate that the Canadian Coast Guard, along with its U.S. counterparts, the towing industry from both sides of the border, and other interested parties, work towards the preparation of regulations governing tank barge standards acceptable to both jurisdictions. We also suggest that the Canadian Coast Guard, by regulation, apply U.S. standards with regard to the inspection of Canadian tank barges.

Similarly we advocate that the Coast Guard, by regulation, apply Canadian manning standards to all U.S. tugs towing oil and petroleum tank barges. We see no reason to permit tugs which are undermanned by our own standards to tow these potentially dangerous cargoes in our waters.

Few, if any, of the Canadian or U.S. barges engaged in transborder trade are double-hulled. In our view, *all* tank barges carrying oil or petroleum products in our coastal or inland waters should be double-hulled.

We are recommending, in the program described in Chapter 2, that existing owners of Canadian-flag tankers be assisted in replacing their single-skinned tankers with fully double-hulled ones and that the same program be available to assist existing owners of Canadian tank barges. In B.C. some tanker and tank barge owners may not want to take full advantage of this program as it is expected that the gas pipeline now under construction from the mainland to Vancouver Island will greatly reduce petroleum consumption, and hence transportation needs. As such, the use of single-skinned tankers and tank barges between the mainland and Vancouver Island should be permitted to continue until the gas pipeline has been completed in about two years time and high-energy users have converted to natural gas. This waiver must not extend beyond seven years, at which time all tankers and barges must be double-hulled.

Recommendation 6-46

- *The Canadian Coast Guard work closely with its U.S. counterparts and other interested parties to develop adequate tank barge inspection standards.*
- *Canadian manning standards be applied to all U.S. tugs towing oil and petroleum tank barges.*

Recommendation 6-47

All Canadian tankers and barges carrying oil or petroleum products in British Columbia's coastal or inland waters must be double-hulled. The use of single-skinned tankers and tank barges between the mainland and Vancouver Island should be permitted to continue until the new gas pipeline under construction in this area has been completed and petroleum consumption levels diminish. This waiver must not extend beyond seven years, at which time all tankers and barges must be double-hulled.

V. Tug availability and escort

The assistance of tugs is already mandatory under U.S. regulations for large Alaskan tankers inward bound to Puget Sound from the Port Angeles pilot station at the eastern end of Juan de Fuca Strait. At the West Coast hearings, several people called for Canada to impose a similar requirement on laden tankers bound to and from the Port of Vancouver.

On February 14, 1990, Imperial Oil Limited and Trans Mountain Pipe Line Company announced that they would be instituting increased escort tug services for crude oil tankers through Vancouver Harbour. We endorse these precautionary measures and commend these initiatives. These expensive steps were taken only after a careful inquiry assured the companies that they were necessary, and we agree that they are. It should also be noted that Alyeska, the owner of the Trans Alaska pipeline and the Valdez terminal, has instituted such measures in Prince William Sound, following the grounding of the *Exxon Valdez*, and the U.S. Coast Guard is considering making such measures compulsory in Juan de Fuca Strait and Puget Sound.

The availability of tugs to assist in emergencies is also an important component of overall spill prevention efforts. Both Trans Mountain Pipe Line Company and the British Columbia Federa-

"The need for a quick response strike team of trained and well-equipped experts in the areas such as surveillance, beach geomorphology, physical and biological pathways of oil should be looked into."

Colin Wykes, Environment Canada

tion of Labour called for powerful tugs to be on stand-by, specifically in the Strait of Georgia and in Juan de Fuca Strait.

In view of the number of incidents of loaded tankers losing power in the approaches to the Strait in recent years, it is both prudent and necessary to keep capable tugs available on stand-by to perform towing and salvage services. As well, requirements for mandatory emergency towing arrangements for all tankers should be set out (i.e., emergency towlines and escort vessels).

Recommendation 6-48

Tug escort should be extended to the entrance of Juan de Fuca Strait.

Recommendation 6-49

Powerful tugs, able to tow large disabled tankers to safety, be available on stand-by for incidents occurring both within and outside Juan de Fuca Strait, and mandatory emergency towing arrangements should be established.

VI. Charting and mapping

In our interim report, we noted that hydrographic charting of Canada's coastal waters is incomplete and that some existing charts are outdated. We thus recommended that the Department of Fisheries and Oceans accelerate its program to upgrade all hydrographic charts along tanker and resupply routes to modern standards.

We also recognize the need for more comprehensive regional-sensitivity mapping and spill-trajectory modelling for the West Coast. Baseline data on fish habitat off Vancouver Island and the lower mainland is notably lacking. Means of enhancing REET/OSC access to real-time marine weather and water current status reports during crisis situations should also be explored.

Recommendation 6-50

We recommend the development of baseline data on fish habitat, as well as greater regional-sensitivity mapping and spill-trajectory modelling for the West Coast to better understand and mitigate the risks to the environment resulting from marine spills.

VII. Equipment needs and pre-positioning

Much of the coast of British Columbia is virtually inaccessible except by sea. In some areas, a series of inlets, some 30 to 100 kilometres deep, run eastward into the coast. These are bordered by high mountains rising 6000 to 8000 feet directly out of the water, severely limiting potential spill response efforts. For these reasons, special consideration must be given in response plans to the selection, location and transportation of spill response equipment.

At the hearings, several participants spoke of the need to establish depots of response equipment along the coast and added that the potential of such traditional but proven response materials as straw and peat should not be ignored. The Burrard Clean spill response cooperative told us of its plan to establish additional cooperatives at Victoria, Campbell River and Prince Rupert. The Canadian Petroleum Products Institute is in the process of developing a computerized multinational inventory of spill response equipment and negotiating protocols for sharing equipment. The Nuu-Chah-Nulth Tribal Council suggested having stockpiles of very basic equipment, such as shovels and garbage bags, pre-positioned along the coast of Vancouver Island. Several national parks

are in very vulnerable locations and should have spill response equipment immediately available.

B.C. possesses a very large tug and barge fleet whose potential to assist in spill response should not be overlooked either in contingency plans or by On-Scene Commanders. Tank or flat-deck barges can be especially useful in carrying equipment to spill sites and in disposing oily water and debris collected from booms and skimmers. The assistance of the province's significant fishing fleet should also not be ignored. Fishermen could be trained to assist with clean-up operations by using nets — which we saw in Norway — that are specially designed for containment and recovery of oil.

It is particularly important in B.C. that existing Coast Guard vessels, which are deployed throughout the coast, be equipped with basic oil spill response equipment. New vessels should be designed to carry a more complete inventory of equipment and all crews should be fully trained in its deployment.

We hesitate to be overly directive in the above suggestions in light of the broader, consultative approach to the process for designating high-risk areas, spill response priorities and contingency plans we endorse in chapters 3 and 4. However, in light of the quite unique accessibility problems that characterize the West Coast, we felt it important to underline these specific issues.

VIII. Tanker traffic in Burrard Inlet and the Port of Vancouver

At the November 29 hearings in Vancouver, a number of people expressed concern over a recent decision taken by the National Energy Board to approve a request by Trans Mountain Pipe Line Company Ltd. to expand its regional operations and Petro-Canada's plan to begin shipment of a new oil product, methyl tertiary butyl ether (MTBE), from its refinery located at the eastern end of Burrard Inlet. These expansion plans, approved without the benefit of a full environmental impact assessment or review, would significantly increase tanker and barge activity in the Port of Vancouver and Burrard Inlet.

Four of the municipalities most likely to be affected by these decisions, Vancouver, North Vancouver, Port Moody and Burnaby each requested, in one form or another, that an independent, comprehensive environmental risk assessment be undertaken by appropriate authorities. Moreover, until such a review is completed, Port Moody has requested a moratorium on future increases in tanker traffic, while Vancouver and North Vancouver requested a moratorium on future increases in oil exports out of the Port of Vancouver. All four municipalities asked us to endorse their position and convey their views to the Minister of the Environment.

"If the 'have countries' are going to share those resources with the 'have not countries', it's going to have to be done by tanker. We can't build pipelines to Japan and Korea and Third World countries. Tankers will have to move that product."

Grayden Hayward,
Trans Mountain Pipe Line Company Ltd.

After considerable reflection on the issues at stake, we wrote to the Minister on January 3, 1990, apprising him that:

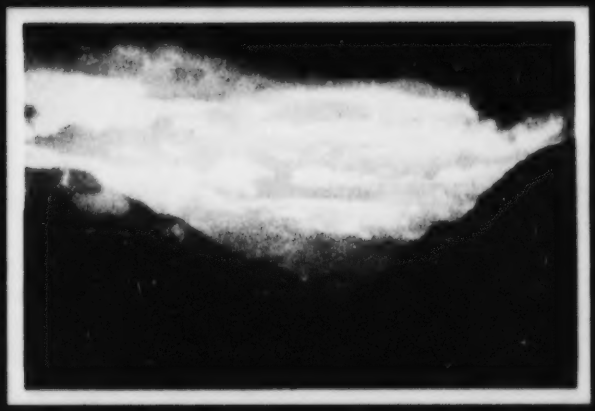
"The cumulative effects of these two decisions would roughly double the volume of tanker traffic in Burrard Inlet without any real public input or substantive environmental assessment of this increased traffic. In short, the overall issue of what constitutes a sustainable level for tanker/barge activity in Burrard Inlet has yet to be discussed. More importantly, the views of those most likely to be affected in the event of an incident have not been heard, and assurances to them regarding the safety of such traffic, contingency plans, liability and compensation have not been forthcoming. In the Panel's view, these concerns should be addressed as a matter of principle."

On March 5, 1990, the Minister replied, indicating that he had instructed officials from his department, the Federal Environmental Assessment Review Office (FEARO), the National Energy Board, the Canadian Coast Guard, the Canada Ports Corporation and the Vancouver Port Corporation to review these issues.

We support this initiative.

Recommendation 6-51

FEARO, or another public consultative body appointed by the Minister of the Environment, conduct a comprehensive environmental and risk assessment of the potential increase in tanker traffic in Burrard Inlet.



Closing comments

Over the next few years, the decisions we take with respect to protecting our environment, and the consequences of those we fail to take, will profoundly affect our future and that of our children. While the magnitude of the global challenges we face is daunting, there is reason for cautious optimism:

- Throughout the world, poll after poll indicates that people are increasingly concerned about the state of the global environment and are willing to make sacrifices to improve the situation.
- Whether by necessity or design, politicians have begun to heed the growing chorus of demands to act decisively by introducing prescriptive policies that both anticipate and address environmental damage.
- Grudgingly, but nonetheless inexorably, business is responding to public demands to consider the environmental consequences of its activities.
- Nations the world over have begun to acknowledge what scientists and environmentalists have long been saying: it will take a massive joint effort, international partnerships and multisectoral cooperation to find solutions to the problems caused by environmental degradation.

We believe that the world is at a significant turning point. Never before have the threats to the global community been so great, and never before has world attention been so focused on any one issue.

While collective action is essential to meeting many of the environmental challenges we face, the quest for international consensus must not become an excuse for domestic inaction. Individual action is better than none at all; it can lead to significant improvements to the environment and may prove a catalyst or model for change elsewhere.

Such is the case with the scourge of marine pollution from tanker operations. We cannot afford to be complacent about the threat it poses to our shorelines. We must act now to protect and preserve our birthright for present and future generations of Canadians. Let us not be afraid to set an example.

Answers can be found — and although the cost may seem considerable, it is a small price to pay to maintain Canada's environmental integrity. We believe that if the recommendations we have put forward in this report are implemented quickly and firmly, the current trend in marine pollution will be reversed and Canadians will be able to enjoy a safer and cleaner marine environment. Inspections and better construction through levies will result in greater diligence at our terminals and safer ships in our waters. Improvements to navigation systems will further enhance safety. Pollution prevention officers, supported by specialized surveillance aircraft, will be able to apprehend polluters, and these in turn will be dealt with appropriately in order to deter others.

Our recommendations are also aimed at increasing public awareness, so that if spills occur, Canadians will be better informed and will find it easier to report them. To the degree they can be, spills will be cleaned up quickly by a coordinated, well-led, well-equipped, and well-rehearsed response team representing government, industry and the public. Meanwhile, the effectiveness of prevention and response measures will be closely monitored and ongoing research and development will be striving to discover new ways to improve clean-up if, in spite of all of this, the worst happens. And if the worst *does* happen, at least we will have done our best to prevent it.

We sincerely hope Canadians will agree with our recommendations, that they will endorse them and that they will oblige their elected representatives to act on them *now*.

Appendix A

List of recommendations

Recommendation 2-1

The Minister of Transport should immediately impose a levy of $2 per tonne on all oil and oil products transported in Canadian waters. The levy should be paid into the Ship-source Oil Pollution Fund, whose purpose should be expanded to expedite replacement of the Canadian-flag fleet with double-hulled vessels and to fund spill response research and equipment purchases.

Recommendation 3-1

Sufficient funds from the Ship-source Oil Pollution Fund be allocated to offset the difference in cost of replacing the Canadian-flag fleet with double-hulled, ice-strengthened ships over a seven-year period. It would be preferable for the new vessels to be constructed in Canadian shipyards.

Recommendation 3-2

- To promote the use of double-hulled vessels, the per-tonne levy on oil carried in Canadian waters be discounted 50 per cent for double-bottomed vessels and set at zero for double-hulled ones.
- Canada should require that in 10 years' time all tankers and tank barges entering its waters be double-hulled.

Recommendation 3-3

In order to reduce the threat of pollution from substandard tankers and tank barges, the Canadian Coast Guard:

- inspect every foreign tanker on its first visit to a Canadian port;
- immediately increase inspection levels to 25 per cent of foreign tankers, in accordance with the Port State agreement;
- significantly increase tank barge inspection levels;
- apply the strictest interpretation to all regulations related to vessel condition and seaworthiness, and detain substandard vessels as a deterrent.

Recommendation 3-4

In order to ensure that chartered tankers meet rigorous vessel, equipment and crew standards, petroleum industry associations and terminal companies be required, in consultation with the Canadian Coast Guard, to:

- develop stringent, revised guidelines for the selection of tankers to be chartered for operation in Canadian waters;

- incorporate strict and independent pre-charter and pre-loading inspections and screening into the chartering process;
- deploy ship-riding inspectors on chartered vessels on a random basis.

Recommendation 3-5

To improve the level and extent of training provided to Canadian seafarers, the Canadian Coast Guard introduce amendments to certification regulations to:

- strengthen Marine Emergency Duties training requirements for masters and officers of all vessels by including environmental emergency training;
- allow it to work with marine training institutes to upgrade basic training and certification programs in oil and chemical products transportation and handling, including spill prevention and response and environmental protection.

Recommendation 3-6

In order to reduce the risk of operational spills resulting from undermanning or fatigue, the Canadian Coast Guard:

- increase the level of vessel inspection and ensure stricter enforcement of existing Canadian and international regulations concerning manning, shifts and rest periods for masters, officers and crews of oil and chemical tankers, and tugs towing oil and chemical tank barges, in Canadian waters;
- review Canada's Safe Manning Regulations to ensure that adequate provisions are in place to regulate manning levels, shift schedules and rest periods for masters, officers and crews;
- issue regulations to provide that only individuals who are not members of a ship's crew, and who have been trained in tanker and barge unloading, loading and transferring operations, be responsible for such activites in Canadian waters.

Recommendation 3-7

In order to reduce the risk of accidents, the Canadian Hydrographic Service:

- accelerate its program to upgrade hydrographic charts focusing on tanker and resupply routes, with priority given to areas where charting is presently incomplete or out of date;
- expedite development of electronic charting technology and the required infrastructure, then introduce regulations requiring the use of electronic charts on all tankers in Canadian waters;
- take measures to ensure that adequate supplies of charts are conveniently available at usual departure ports of ships destined for Canada.

Recommendation 3-8

In order to ensure maximum navigational safety, the development and implementation of long-range navigation systems should be adequately funded and expedited.

Recommendation 3-9

In order to remedy major deficiencies in Canada's Vessel Traffic Services system, the Canadian Coast Guard immediately implement all recommendations outstanding from the 1988 Vessel Traffic Services update study.

Recommendation 3-10

In order to ensure that vessel traffic regulators have sufficient authority to deal with emergencies or hazardous conditions, amendments be made to the *Canada Shipping Act* empowering regulators to establish temporary navigation restrictions or closures because of hazardous traffic, weather or ice conditions.

Recommendation 3-11

In order to reduce the risk of operational spills during terminal operations, the Canadian Coast Guard establish stricter regulations governing loading operations and requiring, among other things, that:

- flexible hoses and hose couplings be designed to a higher standard and inspected frequently;
- as a precaution against spills, booms be deployed during all loading operations, except where booms are demonstrably unsafe or ineffective;
- watch requirements be strengthened during loading and discharging operations to ensure the early detection of spills.

Recommendation 3-12

In order to deter polluters, the Canadian Coast Guard carry out a continuous, coordinated and intensive aerial surveillance program over all Canadian waters. This will require the deployment of three dedicated surveillance aircraft (east coast, west coast, Great Lakes-St. Lawrence) equipped with the latest spill-detection and evidence-gathering technology.

Recommendation 3-13

In order to involve Canadian citizens in the reporting of oil spills, Environment Canada, in cooperation with the provinces, Emergency Preparedness Canada and the Canadian Coast Guard, must:

- disseminate information on the effects of marine spills and spill reporting procedures;

- ensure that 24-hour spill reporting hotlines are established and well publicized;
- establish a system whereby people who file reports leading to the conviction of a polluter may be rewarded (described in Chapter 5).

Recommendation 3-14

In order to deter deliberate or negligent marine pollution, the Canadian Coast Guard significantly improve its investigation of pollution incidents and aggressively prosecute polluters by:

- expanding its investigative and prosecution capability through the deployment of additional personnel, as well as appropriate technology and equipment, including advanced evidence collection and analysis technology;
- implementing selective sampling of fuels and cargoes of vessels docking at Canadian ports for purposes of securing potential evidence for fingerprinting purposes;
- publishing the identity of convicted polluters;
- aggressively following up on cases involving foreign-flag vessels.

Recommendation 3-15

In order to expand Canada's surveillance capability, the Canadian Coast Guard:

- appoint all Coast Guard helicopter pilots as Pollution Prevention Officers and train and direct these pilots to undertake marine pollution surveillance of shipping as part of their routine flight duties;
- appoint selected personnel from other government agencies as Pollution Prevention Officers.

Recommendation 3-16

In order to increase public awareness of marine spills and pollution and their environmental effects, Environment Canada:

- publish an annual report on marine oil and chemical spills;
- address marine pollution through the provision of educational packages to school boards in all coastal areas;
- in cooperation with the Department of Fisheries and Oceans, distribute information kits to fishermen concerning the *Oil Pollution Prevention Regulations* and encourage them to report sightings of marine spills.

Recommendation 3-17

In order to provide a complete and accurate picture of marine spills, Environment Canada, as the agency responsible for the National Analysis of Trends in Emergencies System, strengthen the data base by:

- coordinating the establishment of a comprehensive spill statistics reporting network and ensuring mandatory participation of all relevant agencies (through legislation if necessary);
- reviewing information requirements with other agencies and the public to ensure that the National Analysis of Trends in Emergencies System provides detailed and useful data for analysis by policymakers;
- establishing standard reporting formats to ensure comparability of the data received from different reporting agencies;
- auditing and verifying the quality and consistency of the data being reported to the system;
- ensuring that access to summary information is user friendly and that data summaries are widely distributed.

Recommendation 3-18

In order to minimize the illegal dumping of oily bilge and other wastes, regulations be introduced which:

- require terminals to provide reception facilities adequate to receive all ballast, slop and bilge water from all tankers docking there;
- require terminals to receive oil-contaminated water from tankers before allowing them to depart;
- require tankers to discharge oil-contaminated water at approved reception facilities before entering the St. Lawrence Seaway;
- require that all ballast and bilge valves on Great Lakes tankers be sealed and that these seals be broken only in emergency situations;
- ensure the availability of facilities capable of handling chemical wastes in an environmentally acceptable manner;
- require that inspections be conducted to ensure that reception facilities are being used;
- ensure that reception facility user costs are integrated with other port charges.

Recommendation 3-19

To reduce the risk and impact of chemical spills, the Canadian Coast Guard amend certification regulations to introduce or strengthen requirements for training and certification of all tanker and terminal personnel involved in the transportation and handling of chemical cargoes.

Recommendation 3-20

In order to provide for safer operation of chemical tank barges, the Canadian Coast Guard, in consultation with the U.S. Coast Guard, should introduce stringent standards for design, equipment and operation, with:

- the adoption of the more rigorous provisions of Canadian or U.S. regulations as an interim measure;
- operational and inspection procedures for chemical barge loading and unloading.

Recommendation 4-1

A national response team specializing in chemical spills be formed as an immediate priority and comprise representatives from the Coast Guard, Environment Canada and industry. This team must have major policy development capacity, given the embryonic nature of Canada's chemical spill response framework.

The national chemical spill response team be required to:

- provide advice on the development of a national chemical spill response framework;
- assist in the development, approval and testing of industrial, Coast Guard and port authority chemical spill contingency plans;
- keep up to date on developments in marine chemical spill response techniques and technology;
- assist regional response organizations in the event of a chemical spill and support regional advice to the On-scene Commander, where required;
- assist in training Coast Guard and industry regional chemical response components.

Recommendation 4-2

With respect to a national response model, we recommend the following:

- The oil industry's capacity to respond to spills be augmented to handle spills of up to 10 000 tonnes, as required at the regional level. Industry's response management capacity also be augmented. Both of these aspects of regional collective capacity be reviewed and approved by the Canadian Coast Guard. Since the Canadian Petroleum Products Institute will bear much of the cost of what will now be required of the oil industry, all companies engaged in the refining of oil be required, by legislation, to be members of the CPPI.

- To compensate for industry's limited response capacity in the Arctic, an area of particular sensitivity, the Canadian Coast Guard be assigned special responsibility for ensuring Arctic response capacity for marine spills of all sizes.
- The Coast Guard at all times have overall responsibility for oil spill response at all levels. It must be ready to assume response management from the outset, at the local and regional levels, and to always be in command at the national level.
- The Canadian Coast Guard be given the responsibility and authority to review and approve all facility-level contingency plans.

Recommendation 4-3

In order to increase regional clean-up capacity to the minimum acceptable level, $150 million to $200 million be invested over the next five years. The terms of the Ship-source Oil Pollution Fund be revised to allow capital acquisitions of preparedness equipment by both industry cooperatives and the Canadian Coast Guard.

Recommendation 4-4

The federal government formalize in legislation the responsibility of the Canadian Coast Guard, as the lead agency, to establish and manage Canada's marine oil and chemical spill response capacity. This formalization must reflect the joint responsibilities of industry and government for preparedness measures in language that unequivocally translates the sense of urgency and immediacy required for marine spill response. The authority of the Coast Guard to establish, as well as to command the deployment of, industry and government resources must also be made clear.

Recommendation 4-5

Only experienced personnel who have been trained by the Canadian Coast Guard be designated as On-scene Commanders. A team of OSCs, reflecting an appropriate range of experience and technical exposure, in addition to the ability to exercise command in emergency situations, be established and maintained nationally.

Recommendation 4-6

The term *On-scene Commander* and the acronym *OSC* be applied only to the Canadian Coast Guard appointee.

Recommendation 4-7

Regional Environmental Emergency Teams be established, or expanded, for all regions to ensure broad representation appropriate to the range of potential marine spills. REET chairmen be formally designated from Environment Canada and held accountable for the provision of consolidated environmental advice to the On-scene Commander. In addition, a team of REET chairmen, reflecting the appropriate range of experience, must be established in advance and maintained.

Recommendation 4-8

The Government of Canada assess the capability of the Canadian Armed Forces to assist in oil and chemical spill prevention and response operations. In conjunction with the lead agency, departmental assets, including personnel, be designated, trained and specifically detailed in appropriate national contingency plans.

Recommendation 4-9

To take advantage of local knowledge, and to supplement the clean-up workforce, response operations should use local volunteers whenever possible. Persons who volunteer be paid for their services and be covered by workers' compensation for the duration of their involvement in clean-up operations.

Recommendation 4-10

A national marine emergencies response centre be established within the Canadian Coast Guard as the heart of national response operations. This unit be accountable for the effectiveness of future spill response operations.

Recommendation 4-11

The recommended Coast Guard national marine emergencies response centre must be assigned the leadership role in contingency planning in both the private and public sector. The centre must integrate all plans on a regional and national basis and ensure that plans meet standard criteria set by the Coast Guard.

Recommendation 4-12

So that the level of Canadian marine spill R&D may be adequate to address the significant lack of knowledge and technology, funding be increased immediately to $10 million and raised annually to reach $20 million by 1995, to be shared equally between government and industry.

Recommendation 4-13

A "Marine Spills Technology Committee" be established as soon as possible. It must work under the direction of Environment Canada and be structured to ensure coordination between industry, universities and government.

Recommendation 4-14

To prepare for marine chemical spills, remediation technologies be developed for spills of all chemicals moved in Canadian waters.

Recommendation 4-15

To enhance Canada's ability to clean up oil spills on shore:

- Current shoreline clean-up research be expanded and accelerated.
- Research be done into improved containment and recovery techniques and other promising methods of dealing with oil at sea. It include evaluation of the newer European technology under Canadian conditions.
- Countermeasures for oil spills among broken ice be pursued.
- Research into more effective dispersants be accelerated and pre-authorization of the use of dispersants be considered for protection of environmentally sensitive areas, where their advantages outweigh their disadvantages.

Recommendation 4-16

To ensure effective tracking of spills, Environment Canada be given the resources to:

- establish a remote sensing system capable of locating spills in all Canadian waters and mapping their dispersion;
- accelerate research into remote sensing and the development of more modern systems that overcome the deficiencies of existing technology.

Recommendation 4-17

To facilitate the disposal of oiled debris resulting from spill clean-up operations:

- the Canadian Coast Guard, as lead agency, ensure that all levels of government involved agree on, and pre-authorize, temporary storage as well as treatment sites for marine spill waste materials along all marine transportation routes;
- landfilling of oiled debris must not be practised where alternatives are possible;
- research into better methods of treating oil spill debris must be undertaken as a high priority.

Recommendation 4-18

Whenever possible, the On-scene Commander assist R&D efforts by permitting the testing of new response equipment at spill sites.

Recommendation 4-19

Under the auspices of the Coast Guard, a comprehensive plan for implementing a national marine spill response framework be developed for detailed review and approval. This plan be specific as to response capacities addressed and be developed within one year. An independent assessment of the plan be conducted by Environment Canada and progress reports submitted annually to Parliament by the Minister of the Environment.

Recommendation 5-1

Canada accede to all five annexes of the MARPOL Convention in order to limit the discharge of oil off its coasts, to provide for safe carriage of bulk and packaged chemicals, and to limit environmental damage resulting from the discharge of sewage and garbage from ships. (Existing Canadian standards with respect to sewage should continue to apply.)

Recommendation 5-2

To increase the funding available for compensation of damages caused by spills, Canada ratify the 1984 Protocols to the 1969 International Convention on Civil Liability for Oil Pollution Damage and the 1971 International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage as soon as the second stage of compensation is reached.

Recommendation 5-3

Canada ratify the International Convention on Salvage, 1989, in order to encourage salvors to prevent, minimize, or clean up pollution.

Recommendation 5-4

The *Artic Waters Pollution Prevention Act* adopt the same limitation of liability regime as found in the *Canada Shipping Act*, requiring owners wishing to avail themselves of the limitation of liability to prove that the event occurred without their actual fault or privity.

Recommendation 5-5

Existing legislation be amended to provide that the Ship-source Oil Pollution Fund apply to all ships in waters covered by the *Arctic Waters Pollution Prevention Act*.

Recommendation 5-6

Waste reception facilities be provided at all ports and harbours, and charges for their use be incorporated into the standard docking fee.

Recommendation 5-7

The *Canada Shipping Act* and the *Arctic Waters Pollution Prevention Act* be amended to minimize overlap or conflict.

Recommendation 5-8

The *Canada Shipping Act* and the *Arctic Waters Pollution Prevention Act* be amended to impose a duty on polluters to report and to remedy.

Recommendation 5-9

Shipping safety control zones be extended to 200 miles from Arctic base lines.

Recommendation 5-10

The *Canada Shipping Act* be amended to make it clear that Vessel Traffic Services are to be considered aids to navigation, and Canada's representatives in multilateral fora should make representations to have this recognized nationally.

Recommendation 5-11

The *Canada Shipping Act* be amended to specifically provide for contribution between parties jointly responsible for a spill.

Recommendation 5-12

Canada impose a levy on the bulk movement by ship of all MARPOL-defined categories I and II chemicals as part of the chemical industry's contribution to the maintenance of the regional and national response capacity. In setting this levy, consideration be given to the fact that there are lower volumes of chemicals than of petroleum being shipped.

Recommendation 5-13

In order to deter deliberate and negligent acts of pollution:

- maximum levels of fines provided under any Act of Parliament for acts of pollution be increased to the level of the *Canadian Environmental Protection Act*;
- there be provisions in these Acts for the jailing of culpable executives;
- persons reporting illegal acts of pollution should share in the proceeds of any fines levied, to a maximum of $25,000 per incident.

Recommendation 5-14

Acts of Parliament be amended to include a provision similar to that found in section 41 of the *Fisheries Act* to give judges the authority to fashion sentences appropriate to the offences.

Recommendation 5-15

The *Canada Shipping Act* be amended to make shipowners responsible for any reasonable measures taken by any person to prevent, minimize or clean up the damage, and "Good Samaritans" be protected from suit in the event their well-intentioned actions cause further damage.

Recommendation 5-16

The *Canada Shipping Act* be amended to give private citizens the right to commence a civil action for the benefit of the public for environmental damage caused by oil or chemical spills. Moreover, the definition of "environmental damage" to be set out in this amendment to the Act include all types of loss, damage or harm currently embraced in that term in its usual, ordinary meaning.

Recommendation 6-1

To reduce the risk of major spills caused by collisions and groundings, Vessel Traffic Services be upgraded by:

- installing a third radar system, with the capacity to track small vessels, at Cuslett, Placentia Bay;
- installing state-of-the-art radar equipment and plotting methods in Placentia Bay;
- making all marine traffic separation schemes for the Newfoundland region mandatory;
- initiating a study to determine the feasibility of providing a Vessel Traffic Services centre for the Strait of Belle Isle.

Recommendation 6-2

To reduce the risk of grounding or collision, all tankers should pick up a pilot near Argentia, approximately half-way into Placentia Bay.

Recommendation 6-3

To reduce the risk of a major spill, an ocean-going, ice-strengthened tug or offshore support vessel, with the capacity to carry a full range of ocean recovery and containment systems, be based at Placentia Bay. It should be used to escort tankers between the entrance of Placentia Bay and the Come By Chance refinery, as well as to assist stricken vessels in the Bay, Cabot Strait and the Gulf of St. Lawrence.

Recommendation 6-4

In order to minimize chronic spills, adequate vessel waste reception facilities be established at all major ports, with first and immediate priority given to Come By Chance.

Recommendation 6-5

To deter illegal pumping of routine tank washings and oily bilge water, there be regular aerial surveillance of the waters off Newfoundland.

Recommendation 6-6

To ensure an effective and immediate response capability:

- state-of-the-art offshore equipment, including booms and high-capacity pumps and skimmers, be purchased, and existing equipment not suitable for the region should be relocated to areas where it can be effectively used;
- foreign research and development of open-water containment and clean-up equipment, and retrieval techniques in ice, be followed closely and systems suited to Newfoundland's climate purchased when proven to be effective.

Recommendation 6-7

To improve spill response capability, a computer data base be established, specifying ecologically sensitive areas and the seasonal vulnerability of various physical, biological or cultural resources. Extensive studies must be initiated to gather pertinent oceanographic data around Newfoundland and especially in the Labrador Sea, about which little is currently known.

Recommendation 6-8

To increase public awareness and improve preparedness:

- efforts be made to instill a positive and healthy attitude in the youth of the province through the school system;
- local fishermen be informed of regulations concerning oil pollution and be encouraged to report spill sightings;
- a marine spill response exercise be held in Placentia Bay each year;
- training workshops on the capture, care and cleaning of oiled seabirds be held periodically in high-risk areas.

Recommendation 6-9

In order to provide an effective regional response capacity, spill equipment depots be augmented with modern oil and chemical spill response equipment located at depots in Halifax and Saint John, as well as at all ports and terminal facilities where petroleum products are handled. This capacity be integrated with that of the industry cooperative planned for Halifax.

Recommendation 6-10

In order to deter illegal dumping of wastes, there must be regular aerial surveillance of the waters off the Maritime provinces.

Recommendation 6-11

In order to reduce the risk of a major spill, one or more ocean-going tugs or offshore support vessels be stationed in Maritime waters at all times.

Recommendation 6-12

In order to reduce the likelihood of accidents, the Coast Guard develop guidelines for the operation of tankers and chemical carriers in ice. Furthermore, to reduce the risk of accidents resulting from lack of experience navigating icy waters, the Coast Guard develop manning regulations requiring that all foreign oil and chemical tankers transitting the Gulf of St. Lawrence under icy conditions have an ice pilot or ice advisor on board.

Recommendation 6-13

To determine the ongoing risks of oil seepage from the wreck of the Irving Whale, which now rests on the floor of the Gulf of St. Lawrence with an undetermined amount of Bunker C cargo still on board, the wreck should be examined in 1990 and a decision made as to whether or not to remove the oil and/or raise the barge.

Recommendation 6-14

To ensure the safe operation of Irving Oil's Canaport Monobuoy, the Canadian Coast Guard review all aspects of the operation of the facility, including weather conditions in which vessels will be permitted to moor or remain moored, cargo-transfer procedures, the need for a permanent boom system, staff training and supervision.

Recommendation 6-15

Aquaculture industry representatives should collaborate with Environment Canada and the Department of Fisheries and Oceans to develop oil and chemical spill contingency plans.

Recommendation 6-16

In order to provide for safer navigation, the Canadian Coast Guard:

- install fixed lateral references on land in the Traverse Nord and Lac St-Pierre areas to make it possible to navigate by radar alone;
- equip **all** leading lights with emergency power;
- install an electronic transponder for radar on Banc Morin, offshore from Pointe-au-Pic.

Recommendation 6-17

To improve vessel traffic control in the St. Lawrence region:

- The modernization of radar, tracking system and communications equipment be completed for Montreal and Les Escoumins as proposed in the 1990-92 equipment plan.
- The Quebec Bridge area, the Port of Montreal from Cap St-Michel, the approach to the Port of Sept-Îles, the Traverse Nord, and the approach to Port Cartier should all have radar coverage.
- A regulation be introduced requiring that all vessels navigating the St.Lawrence be equipped with two VHF radios and that these be kept operational at all times.
- Mandatory traffic separation zones be established upstream and downstream from Les Escoumins to reduce the risk of accidents due to the proximity of vessels. These zones should extend as far as Cap-aux-Oies, immediately downstream from the crossing to Île-aux-Coudres.
- The Canadian Coast Guard be assigned statutory authority to restrict or temporarily stop traffic when conditions are deemed to be unsafe, especially upstream from Quebec City and the Traverse Nord when visibility makes it impossible to see spar buoys or leading lights in winter winds.
- The opening and closing of the St. Lawrence Seaway be subject to strict regulation for tankers and vessels transporting hazardous goods and that these be barred from mid-December to mid-April, regardless of seasonal variations in weather.

Recommendation 6-18

- To maintain the present standard of safety in District No. 2, the current proposal to reduce pilotage requirements in that district be withdrawn.
- The Laurentian Pilotage Authority examine the need to introduce a harbour pilot service for the approaches to the ports of Sept-Îles, Baie Comeau and Port Cartier, in District No. 3.
- The assistance of a pilot be compulsory during ice season for all foreign oil and chemical tankers between Port aux Basques and Les Escoumins, and between Sydney and Les Escoumins.
- The same medical norms should apply for all persons exercising similar advisory functions related to ice navigation.

Recommendation 6-19

- The practice of placing booms around tankers as a precautionary measure during hydrocarbon transfer operations should be reintroduced.
- Ship-to-ship cargo transfers on the St. Lawrence River should be restricted to a single site, which should be selected on the basis of its physical configuration in order to minimize the difficulty of clean-up operations.

Recommendation 6-20

- The location and quantity of response equipment stored in the Laurentian region must be suited to the traffic risks, currents, tides, waves and ice conditions which prevail there.
- In order to protect the beluga whales and snow geese, special stores of equipment should be established and contingency plans developed in the Rivière-du-Loup and Montmagny areas.
- The response cooperative for the area between Montreal and Quebec City, whose establishment was announced in Calgary during the hearings, should be made operational at the earliest opportunity.

Recommendation 6-21

To eliminate unnecessary risks on the St.Lawrence, inspection capacity be weighted to provide ship inspection closer to the mouth of the Gulf (at Sydney or Sept-Îles), regardless of the port of destination.

Recommendation 6-22

All tankers navigating under icy conditions in the St.Lawrence River and in the Gulf should meet rigorous ice reinforcement standards and be equipped with stand-by generators and internal recirculation cooling systems. Within seven years, all tankers and barges operating during winter months must be double-hulled.

Recommendation 6-23

In order to avoid groundings, the Canadian Coast Guard establish a minimum keel clearance for vessels using dredged channels.

Recommendation 6-24

- A meteorological buoy be established in the estuary to provide emergency response personnel with access to crucial real-time meteorological information.
- A spill-trajectory model, as well as comprehensive environmental sensitivity maps, be developed for the St. Lawrence.

Recommendation 6-25

- A review of the contingency plans of all agencies and industries be undertaken, in order to verify their compatibility, and field simulations be held annually to ensure their effectiveness.
- A major public awareness initiative be launched to inform all parties who may be involved in a spill of their responsibilities in these contingency plans.
- To protect water intakes, priority be given in all contingency plans to notifying managers of water treatment facilities of any incident or potential incident that may affect their operations. To facilitate this, the locations of drinking water intakes, and contact numbers for their operators, be clearly identified on maps and charts provided to vessels transitting the Great Lakes-St. Lawrence River system and to onshore response personnel.

Recommendation 6-26

- An assessment of the radar coverage throughout the Great Lakes be undertaken, in order to evaluate its adequacy.
- In order to address the high-risk traffic on the St. Clair River-Detroit River system, special attention be paid to that area, in particular to the adequacy and reliability of markers opposite Dow Chemical's Sarnia plant and off the Stokes Point Wharf.

Recommendation 6-27

In order to reduce the risks associated with the movement of oil and chemicals through icy waters:

- within seven years, only double-hulled, ice-reinforced tankers and barges be permitted to transport oil and chemicals through the Great Lakes system in winter months;
- operational guidelines concerning ice navigation conditions be developed;
- a review of tank barge operations in ice conditions on the Great Lakes be conducted in cooperation with the U.S., with a view to establishing rigorous operational guidelines that emphasize safety and environmental protection.

Recommendation 6-28

To avoid groundings in established channels, the Coast Guard decide on a minimum keel clearance for vessels transitting the Great Lakes waterways.

Recommendation 6-29

In order to reduce the risk of accidents resulting from, or being exacerbated by, misinterpretation of information, the Canadian government work with the Ontario and American governments to:

- standardize spill reporting regimes, notification triggering criteria, charts, scales and measures used on the Great Lakes-St. Lawrence Seaway system;
- develop maps indicating wildlife and fish habitats, sensitive marshland and drinking water intakes.

Recommendation 6-30

In order to safeguard drinking water supplies:

- priority be given in all contingency plans to notifying managers of water treatment facilities of any incident or potential incident that may affect their operations;
- the locations of drinking water intakes, and contact numbers for their operators and onshore response personnel, be clearly identified on maps and charts provided to vessels transitting the Great Lakes-St. Lawrence River system;
- spill response equipment, appropriate to the nature of the risk and the currents of the relevant waterway or channel, be stockpiled within the vicinity of, and upstream from, drinking water intakes.

Recommendation 6-31

In order to protect the quality of drinking water, no chemical dispersants be authorized for use on Great Lakes spills until proven to be safe and effective. Moreover, municipalities must be made aware of the ban and the reasons for it.

Recommendation 6-32

We recommend that overland pipelines be the preferred transportation option for Arctic crude oil from the Beaufort Sea-Mackenzie Delta region and that the Government of Canada establish policy to this effect.

Recommendation 6-33

Commercial shipments of crude from Bent Horn not be allowed to expand beyond the current two shipments per year without a full environmental assessment. The current shipments be conducted under Coast Guard supervision using a double-hulled vessel with icebreaker escort.

Recommendation 6-34

In order to minimize risks from tanker shipments in Arctic waters, community fuel resupply operations be kept to an absolute minimum and cost-effective ways of doing this, including alternative energy sources, be explored.

Recommendation 6-35

In order to minimize risks from tanker shipments in Arctic waters:

- it be mandatory for tankers involved in Arctic fuel resupply to be double-hulled;
- existing tankers be grandfathered, but replaced with an ice-reinforced, double-hulled fleet over the next seven years.

Recommendation 6-36

A sensitivity map or atlas for spill response be developed for the Mackenzie River, for use in the event of an oil spill.

Recommendation 6-37

The *Canada Shipping Act* be amended to allow for routing of tanker and tank barge traffic around sensitive areas at crucial times.

Recommendation 6-38

In order to enhance the safety of Arctic resupply operations:

- it be standard practice to have taut cables attached to floating hoses, to bear the strain of wind and tides;
- piers also be constructed at hazardous or high-volume locations.

Recommendation 6-39

In order to facilitate response, the federal government provide a dedicated oil spill monitoring and clean-up vessel for operation during each Arctic shipping season.

Recommendation 6-40

In order to accelerate spill response, all Canadian Coast Guard icebreakers operating in the Arctic should have containerized spill clean-up equipment on board, as well as a crew trained in its use.

Recommendation 6-41

In order to speed up spill response, all tankers and barges in the Arctic should have oil spill containment and recovery packages on board, as well as crews trained in their use.

Recommendation 6-42

- In order to enhance local response capability, the Canadian Coast Guard ensure that Arctic communities where oil is handled be supplied with oil spill containment and clean-up packages, and that sealift communities be equipped to handle a spill consistent with the worst-case scenario.
- In order to improve response times, Arctic response equipment, including life support equipment, be relocated to the Arctic and regional depots be established for rapid deployment to spill locations.

Recommendation 6-43

In order to promote navigational safety:

- Decisions regarding shipping routes should take into account the environmental impact on the British Columbia coast of high seas break-ups or accidents.
- The waters along the west coast of Vancouver Island be submitted to the IMO for recognition as a "Special Area". In the interim, a traffic separation scheme should be developed and implemented in the area.
- Aerial surveillance of the West Coast Tanker Exclusion Zone be commenced immediately to ensure compliance.
- Oil tankers be prohibited by regulation from using Grenville Channel when transitting between Triple Island and Kitimat and additional navigational aids should be provided to facilitate this route change.
- As a priority, the Canadian Coast Guard examine existing traffic routing schemes with a view to reducing the risk of collision due to traffic concentration at the entrance to Juan de Fuca Strait.

Recommendation 6-44

We recommend that the government consider immediate upgrading of equipment, extension of coverage, and changes in procedures for Vessel Traffic Services to improve tanker safety in Canadian waters. This upgrading must include:

- replacing existing video with extended radar coverage to eliminate the blind sector on the north side of the Port of Vancouver and to the east of Second Narrows;
- increasing Vessel Traffic Services radar coverage at Tofino, the north end of Vancouver Island, the Queen Charlotte Islands and the entrance to Prince Rupert.

Recommendation 6-45

In order to promote navigational safety, Canadian authorities should begin consultations with their U.S. counterparts as soon as possible to establish mandatory pilotage for all tugs (with the exception of Canadian tugs on coastal voyages) towing petroleum or chemical barges in Juan de Fuca Strait, Haro Strait, Boundary Pass, the Fraser River, Burrard Inlet, the Strait of Georgia and the Inside Passage.

Recommendation 6-46

- The Canadian Coast Guard work closely with its U.S. counterparts and other interested parties to develop adequate tank barge inspection standards.
- Canadian manning standards be applied to all U.S. tugs towing oil and petroleum tank barges.

Recommendation 6-47

All Canadian tankers and barges carrying oil or petroleum products in British Columbia's coastal or inland waters must be double-hulled within seven years. The use of single-skinned tankers and tank barges between the mainland and Vancouver Island should be permitted to continue until the new gas pipeline under construction in this area has been completed and petroleum consumption levels diminish. This waiver must not extend beyond seven years, at which time all tankers and barges must be double-hulled.

Recommendation 6-48

Tug escort should be extended to the entrance of Juan de Fuca Strait.

Recommendation 6-49

Powerful tugs, able to tow large disabled tankers to safety, be available on stand-by for incidents occurring both within and outside Juan de Fuca Strait, and mandatory emergency towing arrangements should be established.

Recommendation 6-50

We recommend the development of baseline data on fish habitat, as well as greater regional-sensitivity mapping and spill-trajectory modelling for the West Coast to better understand and mitigate the risks to the environment resulting from marine spills.

Recommendation 6-51

The Federal Environmental Assessment Review Office, or another public consultative body appointed by the Minister of the Environment, conduct a comprehensive environmental and risk assessment of the potential increase in tanker traffic in Burrard Inlet.

Appendix B

Terms of reference

Task

1. Objective

To review the systems currently in place to support the safe movement of oil and chemicals in bulk by tanker through Canadian waters and fishing zones, and the capability of Canada to respond to tanker spills of these materials, including the relevant statutory and policy areas, emergency preparedness and pollution countermeasures capability, developing recommendations as necessary.

2. Scope

In light of recent casualties involving tanker* traffic using these waters, the review will first focus on Canada's Pacific coast. However, the review will also include Canada's Atlantic coast, the St. Lawrence River and Great Lakes system, which have traditionally carried significant volumes of tanker traffic. Though traffic volumes are much lower, and seasonal, the review will also cover both the eastern and western Arctic waters.

3. Elements for review

The Public Review Panel is tasked with the following:

a. ***Policy***

To review the existing legislative regimes and policies, including:

i) The adequacy of national and international legal regimes governing liability and compensation related to oil and chemical spills from tankers;
ii) The adequacy of the existing international conventions and standards for the design, construction, manning, and operation of tankers, and Canada's position with respect to these conventions and standards;
iii) The responsibilities of the polluter and the various levels of government in the event of an oil or bulk chemical spill from tankers;
iv) The roles and responsibilities of the various federal departments, provincial and territorial government agencies with respect to tanker spills of oil and bulk chemicals.

b. ***Prevention***

To review the safety systems currently in place to support the safe movement of oil and chemicals in bulk by tanker, in those areas with significant traffic levels, including:

i) The review of existing navigational support services such as vessel traffic management systems, aids to navigation and radio coverage, hydrographic charts and safety publications, and the possible application of new technologies;

ii) The existing Canadian standards and regulations governing the design, maintenance and operation of tankers registered in Canada or operating in Canadian waters, including the appropriateness of the current inspection process for tankers entering Canadian ports;

iii) The review of the existing west coast exclusion zone guidelines for the operation of tanker traffic between Alaska and U.S. west coast ports. The monitoring of compliance with these guidelines, and possible allowance for seasonal adjustments to the exclusion zone will also be included.

c. *Preparedness*

To review the existing response capability of the Canadian petroleum, chemical and shipping industries and of government in Canada with respect to tanker spills of oil and bulk chemicals, and including:

i) The existing contingency plans and emergency planning process;

ii) The scientific and environmental professional support provided for contingency planning, clean-up and impact assessment;

iii) The adequacy of industry's response capability;

iv) The adequacy of the federal government's response capability;

v) Existing and new technology available to responders.

* Throughout these terms of reference, *tanker* includes both tank ships and tank barges.

Appendix C

Panel members

David Brander-Smith, Q.C. (Panel Chairman) is a Vancouver-based lawyer and senior partner with the firm Bull, Housser and Tupper. He practises as general litigation counsel and has a wealth of experience in several areas of law. For many years, he has concentrated on admiralty and maritime law, particularly ship collision and salvage.

A participant in numerous studies and discussions on Canadian oil pollution legislation and on the *Arctic Waters Pollution Prevention Act*, Mr. Brander- Smith is past president of the Canadian Maritime Law Association, a member of the Association of Maritime Arbitrators of Canada and the Vancouver Maritime Arbitration Association, National Director of the Arthritis Society, as well as Chairman of its B.C. and Yukon Division.

Denise Therrien, P. Eng., is a chemical engineer and one of the directors of the Technology and International Affairs Group at Hydro-Québec. She holds a Master's degree in Environmental Engineering from the École Polytechnique of the University of Montreal. A strong proponent of environmentally sound engineering, she has addressed numerous domestic and international conferences on the subject.

During her tenure as Environment Director for the Société d'Énergie de la Baie James, she supervised a multidisciplinary team of specialists whose task was to minimize the environmental impact associated with the construction of the La Grande complex. She also chaired a Quebec Order of Engineers committee on the role of women engineers.

Stan Tobin, a well-known conservationist, farmer and fisherman, is founder of the Avalon Conservation Society, a non-profit group committed to environmental preservation. He is also President of the Newfoundland-Labrador Environmental Association and owner of Spyglass Holding Limited in Ship Cove, Newfoundland.

Appendix D

Hearing locations

Location	Province	Date (1989)
Vancouver	BC	July 25, 26, 27
Victoria	BC	July 28
St. John's	NF	Aug. 22, 23
Come By Chance	NF	Aug. 24
Iqaluit	NT	Sept. 11
Pond Inlet	NT	Sept. 12
Resolute	NT	Sept. 13
Inuvik	NT	Sept. 15
Sault Ste. Marie	ON	Sept. 25
Sarnia	ON	Sept. 27
Toronto	ON	Sept. 28
Montreal	PQ	Oct. 10, 11
Rimouski	PQ	Oct. 12
Quebec City	PQ	Oct. 13
Halifax	NS	Oct. 24, 25
Sydney	NS	Oct. 26
Saint John	NB	Nov. 7, 8
Charlottetown	PE	Nov. 9
Prince Rupert	BC	Nov. 20
Calgary	AB	Nov. 22
Norman Wells	NT	Nov. 23
Whitehorse	YT	Nov. 27
Vancouver	BC	Nov. 29
Tofino	BC	Nov. 30
Vancouver	BC	Dec. 1

Appendix E

Hearing participants

Newfoundland and Labrador

Atlantic Airways Limited; R.G. Halliday

Atlantic Petroleum Association; Edgar Bemister

Avalon Conservation Society; Pierre Ryan

Canada-Newfoundland Offshore Petroleum Board; H. James Strain

Canadian Coast Guard, Newfoundland Region; Lorne Humphreys

Canadian Helicopters Corporation; Paul Conway

Come By Chance Area Regional Fishermen's Committee; Earl Johnson

Department of Environment and Lands, Government of Newfoundland and Labrador; Carl Strong

Department of Fisheries, Government of Newfoundland and Labrador; R. Matthews

Department of Fisheries and Oceans, Newfoundland Region; Mac Mercer

East Coast Spill Response Inc.; Greg Warbanski

Environment Canada, Atlantic Region; Hugh Hall

Fisheries Products International; Richard Moores

Labrador Inuit Association; Sharon Edmunds

LeDrew, Fudge and Associates Ltd.; J. Callum Thomson

Nautical Institute, Newfoundland Branch; Captain Denis Drown and Norman Baird

Newfoundland and Labrador Institute of Fisheries and Marine Technology (The Marine Institute); Leslie O'Reilly

Newfoundland and Labrador Wildlife Federation

Newfoundland Processing Limited; David Bussey

NORDCO Ltd.; John Henley

NorTek Engineering Inc.; Steven M. Millan

Northland Associates Ltd.; E.R. Dawe

Nupro Ltd.; John Robinson

Ocean Sciences Centre; R.L. Haedrich

St. John's Port Corporation; D.J. Fox

Wildland Tours; David Snow

Nova Scotia

Acadia University; Richard J. Palczynski

Canadian Bar Association, Maritime Law Section: Wylie Spicer

Canadian Coast Guard, Maritimes Region; Ken Curren

Canadian Maritime Law Association; Edgar Gold

City of Dartmouth; John Savage, Mayor

The Company of Master Mariners of Canada, Maritimes Division; Captain Angus McDonald

Department of the Environment, Government of Nova Scotia; Armand P. Pinard

Department of Fisheries and Oceans, Scotia-Fundy Region; Stephen McPhee

Eastern Marine Services Limited; W.G. Wallace

Eaton, R. Mike

Environment Canada, Atlantic Region; Hugh Hall

Fisheries Information Services; Owen Myers

Forgeron Enterprises; Al Forgeron

Geomatic Technologies Incorporated; Herbert Ripley

The Halifax and Cape Breton Marine Pilots; Captain Alan Stockdale

Halifax Port Corporation; D.F. Bellefontaine

Holm, John; MLA, Nova Scotia New Democrats Environment Critic

Inland Waters, Coastal and Ocean Information Network (ICOIN) Secretariat, Champlain Institute; Michael J.A. Butler

MacLaren Plansearch Limited; Dr. Eid

Orion Electronics Limited; Robert Crockett

Pittman, Terry

Scott Marine Technical Services Limited; Captain Barry J. Scott

Sydney Harbour Ports Regional Development Board; John Shaw

New Brunswick

Atlantic Pilotage Authority; Captain Thomas Sellers and Captain Ted Worthington

Canadian Coast Guard, Maritimes Region; Ken Curren

Charlotte County Community Futures Inc.; Norma C. Stewart

The Company of Master Mariners of Canada; Captain J.M. Ashton

Conservation Council of New Brunswick; David Thompson

Department of Fisheries and Aquaculture, Government of New Brunswick; Mr.Ozerden

Department of Natural Resources and Energy, Government of New Brunswick; Bryan Walker

Environment Canada, Atlantic Region; Hugh Hall

Irving Oil Limited, Kent Line Limited and Atlantic Towing Ltd.; John Wallace

Jamieson, Stewart, MLA (Saint John-Fundy)

Legacy; Helen Hanratty

Marine Atlantic; Captain Peter Heathcote

New Brunswick New Democrats; Elizabeth J. Weir

Saint John Commercial Fishermen's Association; Dallas Moyer

Saint John Marine Pilots; Captain O.L. Nason

Saint John Port Corporation; Captain A.L. Soppitt

Union of New Brunswick Indians; Ronald Perley

Prince Edward Island

Canadian Coast Guard, Maritimes Region; Rod Straight

Cork Can. Inc.; Cathryn Dagenais

Department of the Environment, Government of Prince Edward Island; Mr. Desroches

Maritime Fishermen's Union; Kirk Munro

Natural History Society of Prince Edward Island; Patrick Wootton

Quebec

Alliance des pêcheurs commerciaux du Québec; François Poulin

Association pour la prévention des catastrophes; Mohammed El-Sabh

Atlantic Salmon Federation; Alex T. Bielak

Bell Helicopter Textron Inc.; Jean-Paul Cadieux

Canadian Coast Guard; Jacques E. Clavelle

Canadian Merchant Service Guild; Wallace R. Hogg

Canadian Shipowners Association; Norman Hall

La Chambre de commerce de Rimouski; Irvain Pelletier

City of Montreal; Jean Doré, Mayor

City of Rimouski; Eva L. Côté, Alderman

Comité de l'environnement de Chicoutimi Inc.; Pierre Gravel

Comité des utilisateurs des installations portuaires du parc industriel de Bécancour;Jean-Guy Chouinard

Corporation des pilotes du Bas St-Laurent; Jacques Pouliot

Corporation of the Upper St. Lawrence Pilots; Captain Pierre Boucher

Department of Fisheries and Oceans, Quebec Region; Denis Martin

Environcorp Inc.; Marcel Ricard

Environment Canada, Quebec Region; Jean-Pierre Gauthier

Federation of the St. Lawrence River and Great Lakes Pilots; Michel Desrochers

Gaudreau, Vaillancourt and St-Pierre; John G. O'Connor

Geltman, Harold

Grévisse, Jacqueline

Groupe d'initiatives et de recherches appliquées au milieu (GIRAM); Gaston Cadrin

Hervieux, Gaston

Institut maritime du Québec; Raymond Giguère

Institut national de la recherche scientifique (INRS) Océanologie; Emilien Pelletier

Laurentian Pilotage Authority; Jacques Chouinard

Lutzer, Suzanne

MIL Davie Inc.; M.G. Ayre

Ministère de l'agriculture, des pêcheries et de l'alimentation, Québec; Michel Pageau

Municipalité de Rimouski-Est; Gilbert St-Laurent

Nutak Horizons Inc.; Joe Shormann

Pétromont, Marcel Emond

Pilotes du Saint-Laurent central Inc.; Gilles Denis

Port de Montréal; D. Hassib

Port of Quebec Corporation; Yvon Bureau

Quebec Petroleum Association; René Miglierina

Les Remorqueurs du Québec Limitée; Captain Norman Berrigan

Seafarers' International Union of Canada; Andrew Boyle

The Shipping Federation of Canada; Captain Ivan Lantz

Société du Port de Valleyfield; M. Morin

Soligaz; Bernard Poirier

The St. Lawrence Seaway Authority; J.M. Kroon

Stolt-Nielsen Inc.; Alfred E. Shultz

Trillium Shipbrokers Ltd.; Roger Jeavons

Ultramar Canada Inc.; Dick Tribe

Union québécoise pour la conservation de la nature; Jean-Louis Latulippe

Ontario

Bay of Quinte Remedial Action Plan Coordinating Committee; Murray German

The Board of Trade of Metropolitan Toronto

Caccia, Charles, M.P. (Davenport)

Canadian Brotherhood of Railway, Transport and General Workers; T.N. Stol

Canadian Coast Guard, Central Region; David McMinn

Canadian Marine Pilots Association; Michel Pouliot

Canadian Nature Federation; B.T. Aniskowicz

Canarctic Shipping Company Limited; Captain Andrew Taylor and W.R. Mann

Citizens for Public Justice; Art de Groots

Community Awareness Emergency Response (CAER); Allen R. Wells

The Company of Master Mariners of Canada; Captain J.W. Brewster

Corporation of Professional Great Lakes Pilots; Captain Robert Stevenson

Corporation of the City of Sault Ste. Marie; John W. Nelson

Department of Fisheries and Oceans, Central and Arctic Region; John Shaw

Environment Canada, Ontario Region; Kim Shikaze

Great Lakes Pilotage Authority, Ltd.; R.G. Armstrong

Great Lakes United; John Jackson and Philip E. Weller

Hamilton Harbour Commissioners; Ian Noble

Ireland, Ray

Lambton Industrial Society; Ron Denning

Lauckner, G. Richard

Lee, Kristina

McCandless, Robert

Ministry of the Environment, Government of Ontario; Walter Giles

Ontario Petroleum Association and Petroleum Industry Marine Environmental Cooperative (PIMEC); George Brereton

Peacock Inc.; Jim Young

Polysar Limited; B.G.S. Withers

Port of Thunder Bay, Thunder Bay Harbour Commission; Cy Cook

St. Lawrence Remedial Action Plan; Rick Eamon

St. Mary's Remedial Action Task Force; Walter Sarich

The Toronto Harbour Commissioners; I.C.R. Brown and Captain W.S. Culberston

Town of Fort Erie; Carolyn J. Booth

University of Toronto; Donald MacKay

Windsor & District Labour Council; Rick Coronado

WM. Finkle Machine Company Ltd.; W.E. Finkle

Alberta

Canadian Petroleum Products Institute (CPPI); Claude Brouillard

Gulf Canada Resources Limited; Captain Keith Jones

Imperial Oil Limited; Richard Dupuis

Nelson, R. Wayne

North Am Energy Consultants Ltd.; Metro Koziol

Petro-Canada; Bob Dart

Shell Canada Limited; Andrew Marynowski

Northwest Territories

Amarualik, Simeonie

Anawak, Jack; M.P. (Nunatsiaq)

Arctic College; Bruce Rigby

Baffin Region Inuit Association; Duncan Cunningham

Baffin Regional Chamber of Commerce; Jacques Belleau

Beaufort Sea Oil Spill Equipment Cooperative; Peter K. Devenis

Canada Oil and Gas Lands Administration (COGLA); V. Lafferty

Canadian Coast Guard, Eastern Arctic Sealift, Resolute Bay; Tom Irving

Canadian Coast Guard, Northern Region; Carol Stephenson

Canarctic Shipping Company Limited; Captain Andrew Taylor

Department of Fisheries and Oceans, Central and Arctic Region; Rob Stewart

Department of Indian Affairs and Northern Development; W.J. Stephen

Department of Renewable Resources, Government of the Northwest Territories; Emery Paquin

Department of Transportation, Government of the Northwest Territories; H.J. Gerein

East Three Enterprises; Captain Gordon Robertson

Environment Canada, Western and Northern Region; Bill Brackel

Esso Resources Canada Limited; Al Short

Hagen, Larry A.

Hamlet of Tuktoyaktuk; Randal Pokiak, Mayor

Inuit Circumpolar Conference; Les Carpenter

Inuvialuit Regional Corporation and the Inuvialuit Game Council; Roger Gruben

Jesudason, Besel

Lancaster Sound Regional Land Use Planning Commission; David Mablick

Mackenzie Delta Beaufort Sea Regional Land Use Planning Commission; Charles Haogak

Municipality of Spence Bay; Steve Alookee

Northern Transportation Company Limited; Paul Prevel

Okpic, Abraham

Panarctic Oils Limited; Grey Alexander

Pond Inlet Hunters and Trappers Association; John Tongak

Resolute Bay; Ludy Pudluk, Mayor

Roberts, David

Shihta Regional Council; Bill Byrne

Town of Inuvik; John Hill and Tom Detlor

Wild, Ron

Yukon

Canada Ports Corporation; Jean-Michel Tessier

Canadian Arctic Resources Committee; Lindsay Staples

Ministry of Economic Development, Government of Yukon;
Piers MacDonald, Minister

Gwich'in Steering Committee; Norma Kassi

Yukon Conservation Society; Darielle Talarico

British Columbia

Anglican Diocese of Caledonia; Reverend Peter Hamel

Armstrong, Lindsay

Association of Professional Biologists of British Columbia; William J. Schouwenburg

Barham, Andrew

Barrett, John

Brandon, L.V.

Brewin, John, M.P. (Victoria); Lynn Hunter, M.P. (Saanich-Gulf Islands); DaveBarrett, M.P. (Esquimalt-Juan de Fuca); David Stupich, M.P. (Nanaimo- Cowichan);Robert Skelly, M.P. (Comox-Alberni); Ray Skelly, M.P. (North Island-Powell River)

The British Columbia Coast Pilots Ltd.; Captain J.D. McNeill

The British Columbia Federation of Labour; Bruce Elphinstone

British Columbia Oyster Growers Association; Deb Logan

British Columbia Society for the Prevention of Cruelty to Animals; Al Hickey

British Columbia Wildlife Federation; Stu Reeder

Bundy, John E.

Burnaby Citizens for Environmental Protection and Port Moody Concerned Citizens for a Clean Environment; David Fairey and Julie Barber

Burrard Clean; Martyn Green

Call for an I «juiry; Cliff Stainsby, Bob Bossin and Dr. Andrew Thompson

Canadian Bar Association, British Columbia Branch; Douglas Schmitt

Canadian Brotherhood of Railway, Transport and General Workers; Al Engler

The Canadian Chemical Producers' Association; Marc Bélanger

Canadian Coast Guard, Western Region; Glen Stewart

Canadian Merchant Service Guild; Leo H. Gray and Ashley Humphrey

Canadian Union of Public Employees (CUPE), British Columbia; Geraldine McGuire

The Chamber of Shipping of British Columbia; Richard C. Stevens

CHEMPRO; H.T. Enger

Chevron Canada Limited; Bill Haslam

City of Port Moody; David Driscoll

City of Prince Rupert; Richard Roy

City of Vancouver; M. Kinsella

City of Victoria; Eric Simmons

The Company of Master Mariners of Canada, Vancouver Division; Captain Paul Charter and Captain Morton

Conair Aviation Ltd.; Bruce Emery

Cooke, R.W.

The Corporation of the District of Powell River; Don Lockstead

Council of British Columbia Yacht Clubs; Richard K. Niven

Council of Marine Carriers; A.M. Fowlis

Cove, Derek

Cowling, Captain John

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5. Human Factors in Tanker Safety; Human Factors North, Toronto; December 29, 1989.
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Prevention issues

1. Navigation Support Systems
2. Exclusion Zones
3. Analysis of Pollution Causes to Identify Gaps in Safety Systems
4. Adequacy of Canadian Standards and Regulations re Tankers and Tank Barges

Volume 2

Preparedness/response issues

1. Scientific and Environmental Support
2. Contingency Plans
3. National Guidelines for Response
4. Training and Exercises
5. Technology Research and Development
6. Mandatory Review of Contingency Plans
7. Volunteers
8. Chemical Spills
9. National Strike Team
10. Military Personnel
11. Public Expectations

Volume 3

Policy/legislation issues

1. Liability and Compensation
2. Responsibility for Response
3. Adequacy of International Tanker Construction and Pollution Control Standards
4. Definition and Role of Lead Agency and Resource Agencies
5. Federal-Provincial Interfaces
6. Federal Legislation Gaps/Overlaps re Ship-source Pollution
7. Other Legal, Policy and Related Issues

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32.	89-7-11	*Nestucca* Summary, DFO
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34.	89-8-11	Ship-related Spill Incidents — 1984 to Present, EC

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